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WATER-YIELD MAPS FOR IDAHO

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UNITED STATES DEPARTMENT OF AGRICULTURE

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WATER-YIELD MAPS FOR IDAHO [1]

By J. Marvin Rosa [2]

INTRODUCTION

Over the years, practicing hydrologists and engineers have become accustomed to drawing hydrologic maps as if the earth were flat. The watershed area was drawn as a plan view. Then isopleths were drawn through each gage location, as was commonly done for isohyetal maps, and any additional isolines were linearly interpolated between gages.

But why not distribute the water vertically instead of horizontally? Orographic lifting can bring about increased precipitation. Evaporation losses can be less at high, cool elevations. Soil moisture storage is less on shallow, rocky ridges than in deep valley fills. Steep slopes drain faster.

All these conditions are especially important where the snowpack in the mountains is the source of most of the perennial streamflow. In the West, therefore, quite a different looking water-yield map can be drawn from the same runoff data if adjustments are made for altitude.

Small-scale maps of annual runoff for Idaho and adjacent States have been published by the U.S. Geological Survey (2, 3, 4)[3] and the U.S. Army Corps of Engineers (9). Studies leading to more detailed water-yield maps are being conducted by State departments of water resources (1).

All of the maps included in the above publications were based on gaging records furnished by the U.S. Geological Survey and the State engineers, but the scale used in most was so small that there was a tendency to draw water-yield lines through the gage locations. This distorted the maps toward higher yields in the foothill areas. The need exists, therefore, for presenting the same information, adjusted for altitude, on a scale adequate for water management and project planning on small watersheds.

WATER-YIELD RELATIONSHIPS

The construction of water-yield maps must start with an understanding of the land area to be portrayed; that is, the characteristics of water-source areas, and how problems arise when topographic corrections are not made. Of particular concern in this report are some of the Western States, because of extreme topography variations within small areas. Here, large-scale maps are necessary to portray hydrologic conditions on small watersheds.

Data from small watersheds in Idaho suggest the following relationships of water yield to precipitation, elevation, area, and vegetation:

1. For high elevations in Idaho, where there is an adequate supply of moisture, the difference between annual precipitation and annual runoff accountable to evapotranspiration (ET) approaches 17 inches (fig. 1).
2. The relationships between water yield and elevation for the major drainage basins in Idaho are shown in figure 2. Water yield increases with elevation primarily because of the orographic increase in precipitation with elevation and the decrease in evapotranspiration with temperature decreases of 3° to 5° F. per 1,000-foot rise.

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[1] Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture, in cooperation with the Idaho Agricultural Experiment Station.

[2] Research hydraulic engineer, Moscow, Idaho.

[3] Underscored numbers in parentheses refer to Literature Cited, p. 15.

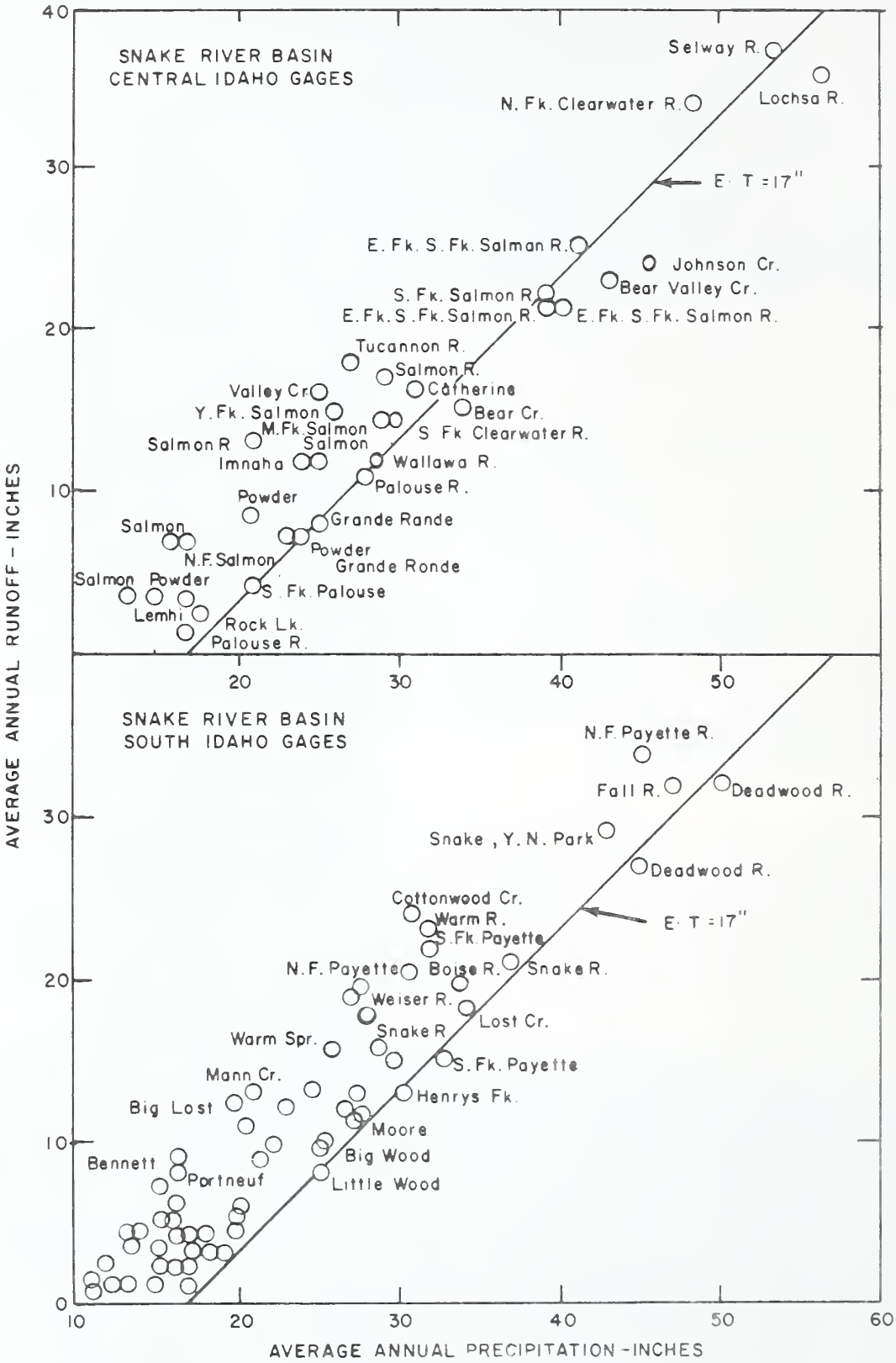

Figure 1.--Relationship of annual runoff to annual precipitation.

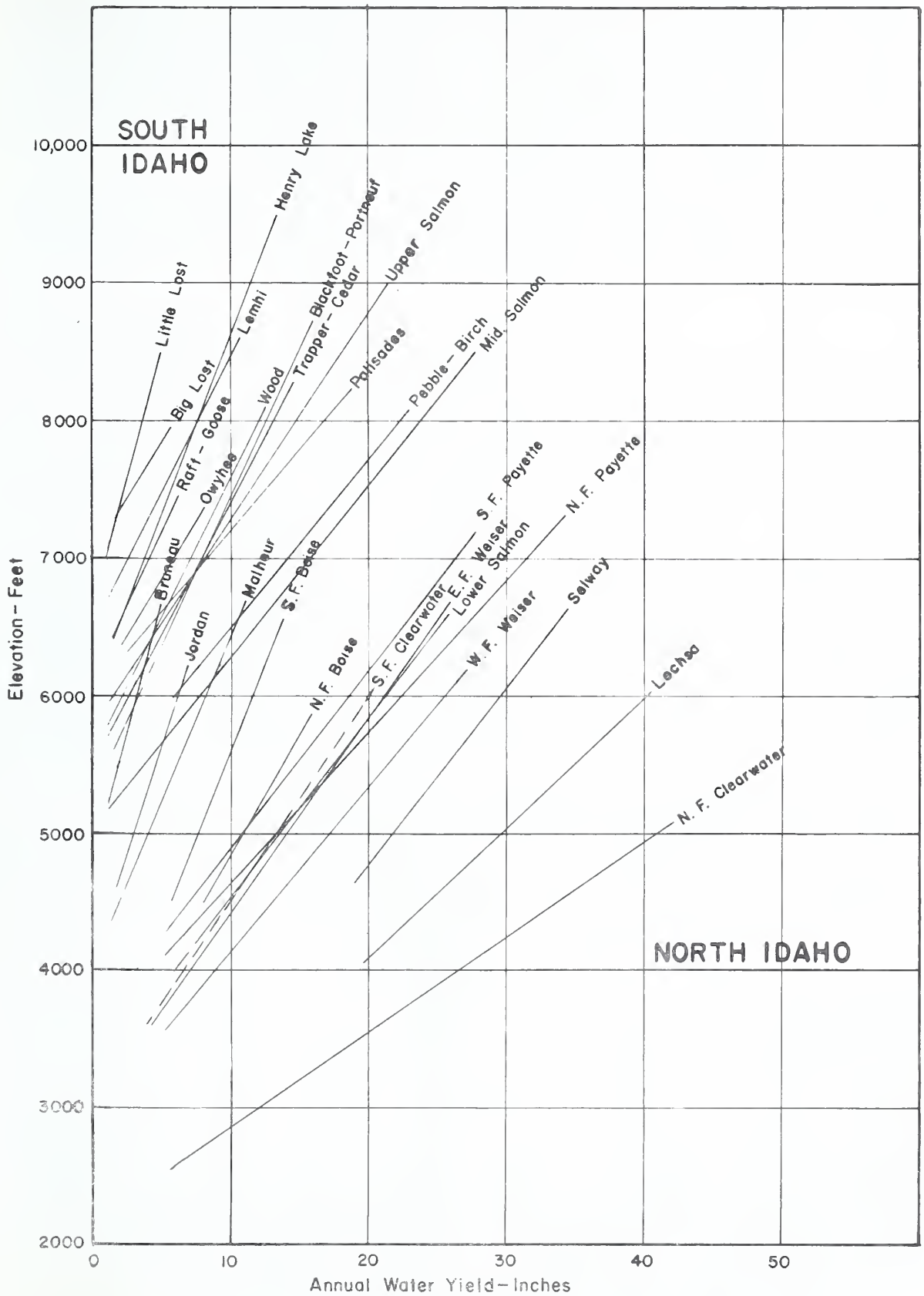

Figure 2.--Annual water yield versus elevation, Snake River, Idaho.

3. Runoff data for the South Fork Palouse River, 1932-47, give little indication of any change in water yield per unit area with increased area of agricultural watersheds under relatively uniform precipitation. The Palouse River had about the same average annual surface runoff from a few acres at Pullman, table 1, as did several hundred square miles farther downstream, table 2. The runoff from agricultural and foothill streams near Moscow, Idaho, is considerably higher than near Pullman, Wash., as shown in table 3. This is because of the higher elevations, rather than the size of the watersheds (fig. 3).
4. Vegetation types may be used as a relative measure of the water yield on different slope-aspects and as an indication of water-yield potential in general. Relative values of water yield for some timber types can be obtained from data submitted to the Senate Select Committee on National Water Resources (8). These average data are presented in table 4.

TABLE 1.--Runoff from small Soil Conservation Service watersheds near Pullman, Wash.

Watershed	Drainage area	Precipitation	Average runoff	Record
	Acres	Inches	Inches	Years
GS-4	2.3	21.82	3.89	1932-38
GS-5	14.4	20.77	2.30	1932-46
GS-6	15.2	20.77	3.03	1932-46
GS-2	68.2	20.43	3.49	1932-46
GS-8	762	19.31	2.11	1934-41
GS-9	879	20.85	2.30	1942-46
GS-10	4,430	22.38	2.44	1942-47

TABLE 2.--Runoff from large watersheds in the Palouse River Drainage Basin

Watershed	Drainage area	Precipitation	Average runoff	Record
	Square miles	Inches	Inches	Years
Dry Fork	7.3	([1])	2.80	1935-38
Missouri Flat	27.5	18.17	3.10	1935-40
Paradise	34.5	([1])	3.70	1935-38
Four Mile	71.9	17.78	2.93	1935-40
South Fork	81.1	18.87	2.91	1935-40
South Fork	132	([1])	2.90	1935-42
Union Flat	189	([1])	2.90	1953-60
Rock Creek	520	([1])	2.90	1904-17
Palouse River	2,540	([1])	3.20	1900-16

[1] Data not available.

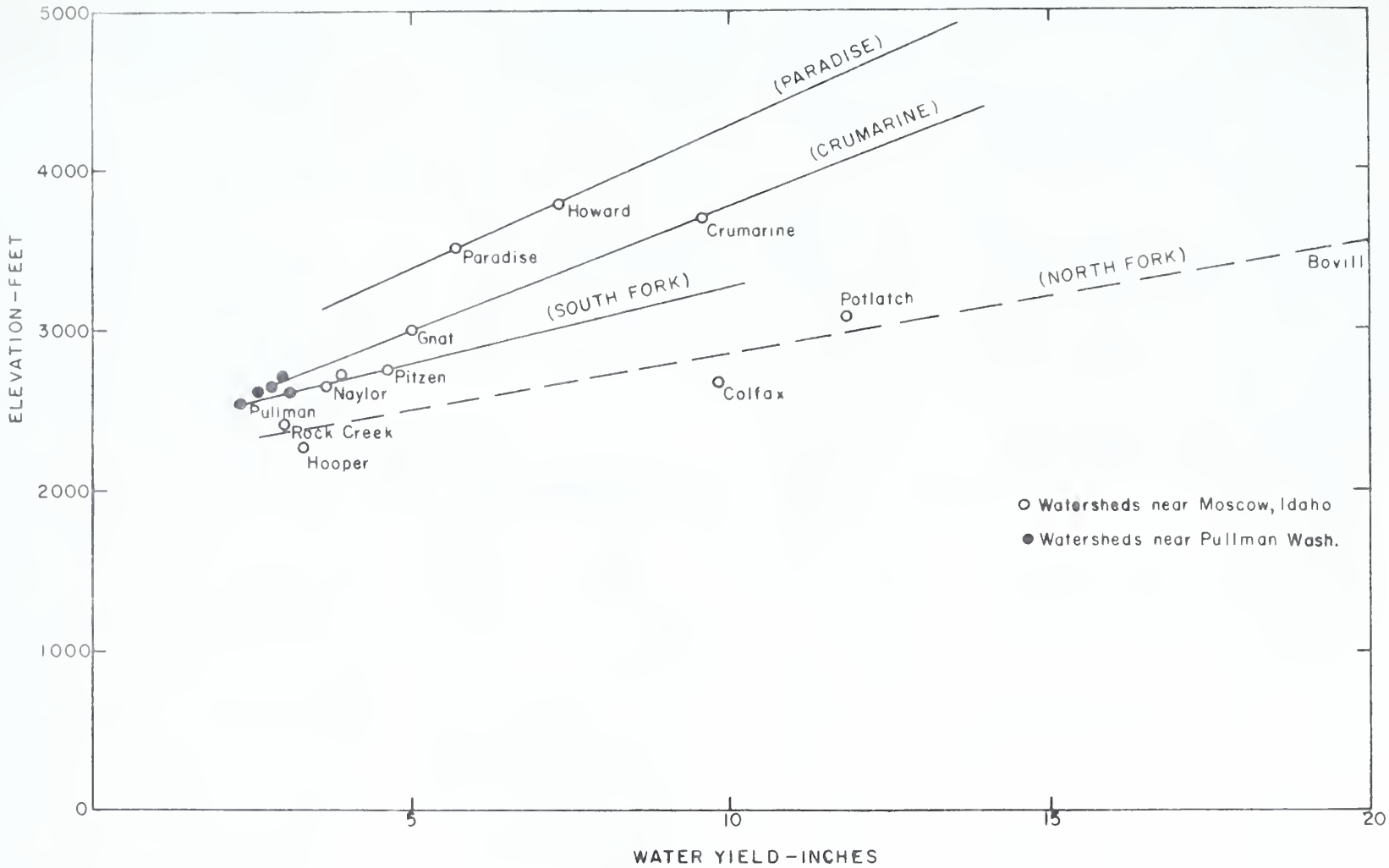

Figure 3.--Water yield versus elevation, Palouse River.

TABLE 3.--Runoff from watersheds near Moscow, Idaho

Watershed	Mean elevation	Area	Precipitation	Runoff	Record
	Feet	Acres	Inches	Inches	Years
Pitzen	2,730	147	21.87	4.65	1937-42
Naylor	2,720	178	22.53	3.92	1937-42
Paradise	3,500	285	([1])	5.7	1935-37
Howard	3,800	333	([1])	7.3	1935-37
Crumarine	3,700	1,560	([1])	9.6	1956-59
Gnat Creek	3,000	2,720	([1])	5.0	1956-59

[1] Data not available.

TABLE 4.--Water relationships for cover types

Cover type	Annual precipitation [1]	Annual runoff [1]	Annual ET
	Inches	Inches	Inches
White pine	25-60	20	22
Spruce-fir	20-45	18	15
Lodgepole pine	20-45	14	19
Aspen	20-45	10	23
Douglas-fir	22-35	7	21
Ponderosa pine	20-30	4	17
Pinyon-juniper	10-20	0.5	15

[1] See Literature Cited (8).

CONSTRUCTION OF WATER-YIELD MAPS

Water-yield maps were constructed from developed altitudinal relationships, and by refining the resulting water-yield lines by use of timber-survey maps and the data in table 4. The boundaries between vegetation types provide a base map with more detail about local climate than can be obtained from the usual gaging network. These lines are especially useful when estimating the location of water-yield lines between widely spaced gage locations.

Since large-scale, vegetation-type maps are now being prepared from aerial photos, many features of slope-aspect can be portrayed. To improve the generalized maps previously available for forested regions in Idaho, additional field observations were obtained to separate the various species which represent different climatic zones. This classification was based on the original stand rather than on lodgepole pine or aspen, which may have come in after fires.

As an example of the procedure, data on runoff, timber surveys, and topographic maps for Mill Creek, located near Colville, Wash., were used to construct a water-yield map. The average annual water yield for this 85-square-mile watershed, for the period 1939-60, was 8.1 inches. The relationship of water yield to elevation, as determined from stream-gaging records in the

vicinity, is shown in table 5. When the estimated water yield is multiplied by the area in 500-foot elevation zones, the computed runoff is about 8.2 inches annually.

If the water yield is estimated by use of the average runoff for each cover type as presented in table 4, the runoff would average about 8.0 inches annually as shown in table 6. Thus, timber-survey maps can be used to refine the location of water-yield lines on various slope-aspects at different elevations. These maps, prepared by the Forest Service, were drawn from aerial photos and printed at a scale of 2 inches to the mile so that timber-typing could be accurately shown.

To apply this technique in constructing water-yield maps for ungaged areas, an areal representation of water yield versus elevation was generalized for the entire State of Idaho. Runoff data obtained by the U.S. Geological Survey and the Idaho State Engineer for drainages of generally 10 to 400 square miles (after adjustment for diversions and length of record) were used to prepare figures 4 and 5. Figure 4 shows the isopleths of the elevation intercept for determining the elevation-annual water yield relationship. By interpolation of values from figures 4 and 5, the relationship for ungaged streams was obtained.

In drawing the water-yield maps, elevation zones were planimetered and the runoff as computed by zones was checked for agreement with the volume of runoff as measured at downstream gaging sites. Finally, refinements were made for different slope-aspects by use of timber-survey maps and field checks on cover types. The water relationships by cover types, table 8, were used as a principal guide. The completed water-yield maps for Idaho and adjacent areas for the 20 quadrangles shown in figure 6 are enclosed in pocket. Water yield as obtained by the developed procedure for comparison with observed water yield is shown in table 7.

TABLE 5.--Water yield by elevation zones, Mill Creek, Wash.

Elevation zone[1]	Area[2]	Water yield[3]
Feet	Square miles	Inches
2,000	8	2
2,500	13.5	4
3,000	23.8	7
3,500	21.4	10
4,000	10.5	12
4,500	6	15
5,000	1.5	20

[1] Elevation zones are inclusive of the area between the successive elevations.
[2] Total area = 84.7 square miles.
[3] Average water yield = 8.2 inches.

TABLE 6.--Water yield by cover types, Mill Creek, Wash.

Cover type	Area[1]	Water yield[2]
	Square miles	Inches
Larch	32.6	8
Lodgepole pine	8.4	14
Ponderosa pine	8.4	4
Douglas-fir	24.8	7
Range	10.5	8

[1] Total area = 84.7 square miles.
[2] Average water yield = 8 inches.

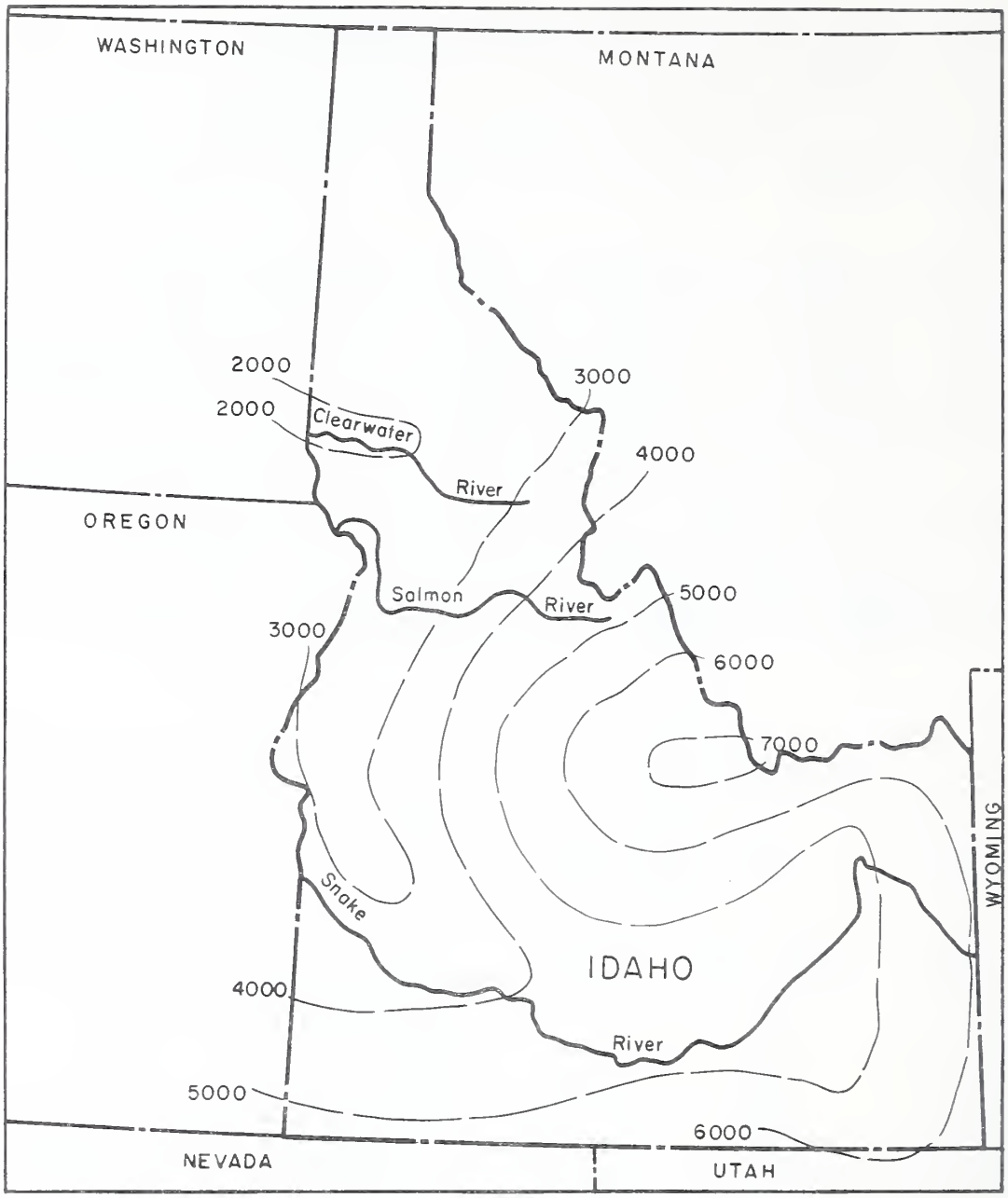

Figure 4.--Elevation intercept in feet for determining elevation-annual water yield relationship.

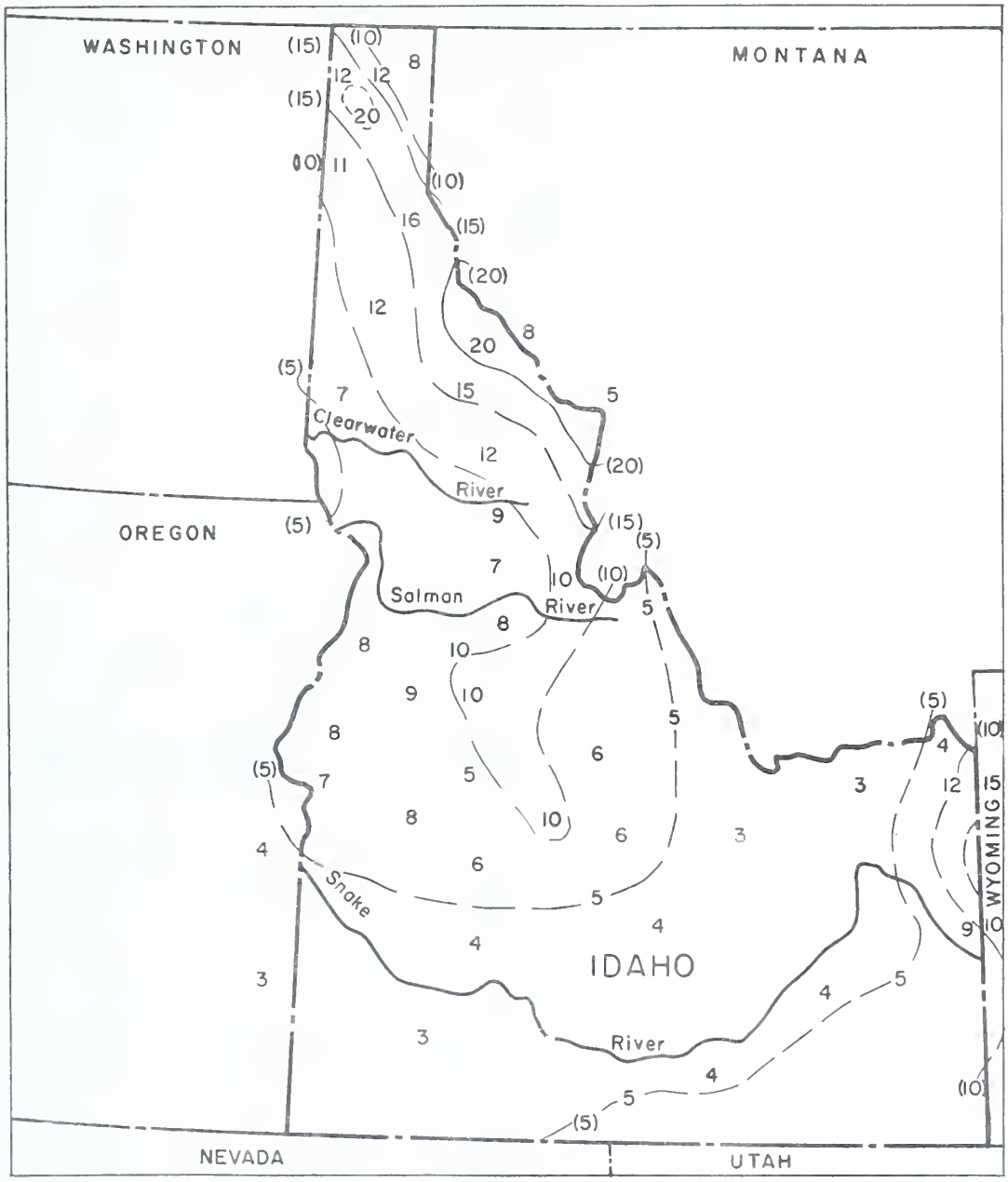

Figure 5.--Increase of water yield with elevation. (inches/1000')

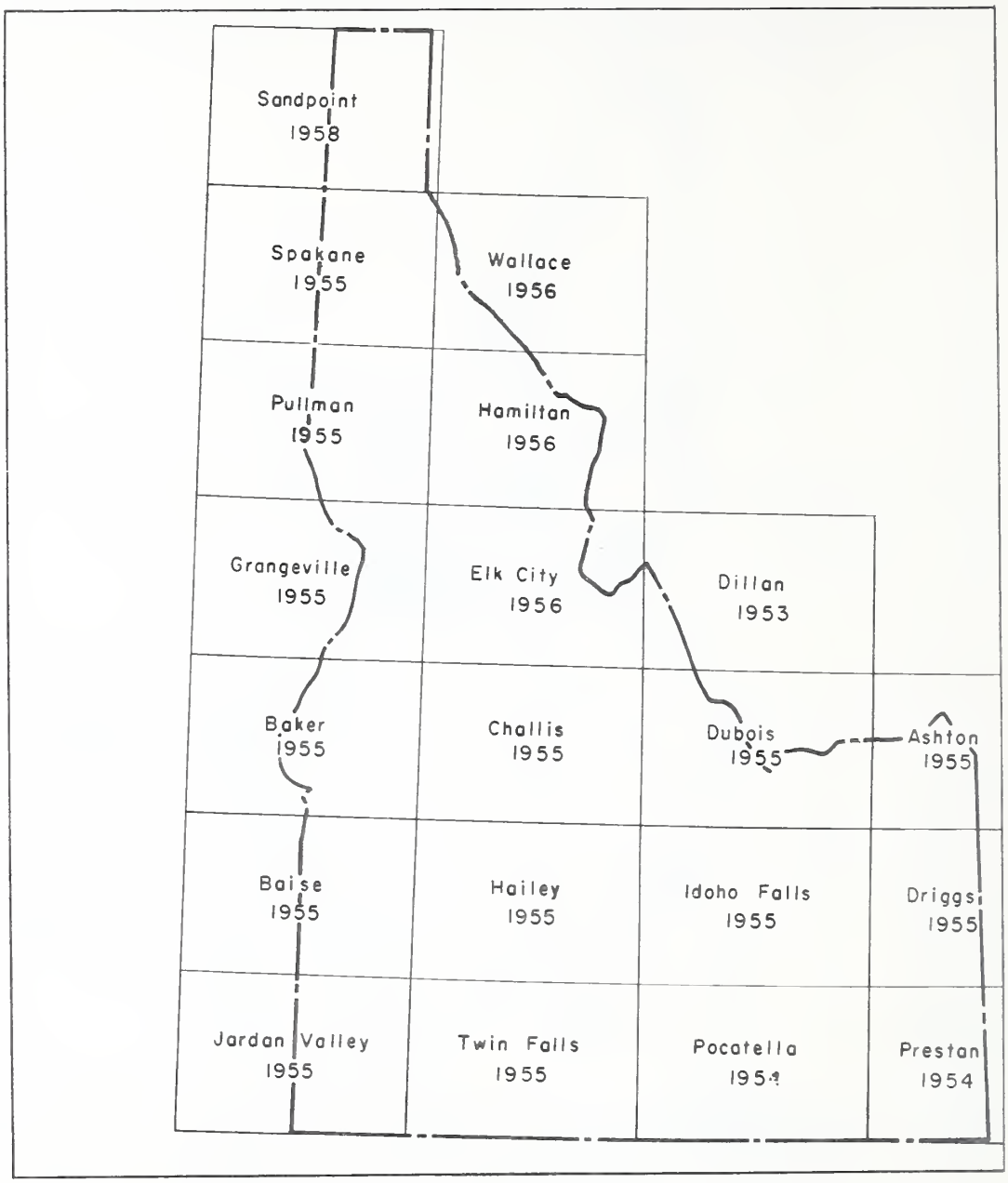

Figure 6.--Quadrangle maps covering Idaho.

TABLE 7.--Comparison of actual and computed water yield

Drainage basin	Drainage area	Annual water yield	
		Gaged	Computed[1]
	Square miles	Inches	Inches
Boise River	1,090	12	12
	830	18.4	17.6
	426	9.4	10
Payette River	779	21.2	21.2
	456	25.5	24.5
	144	32.7	30.5
Weiser River	1,160	10.2	9
	605	14.4	15
	36	15	15.4
Malheur River	982	2.8	3.1
	585	1.2	1.8
	355	5.6	4.8
Wood River	640	8.7	10
	267	7.1	7.5
	96	11.3	10
Owyhee River	550	4.6	4.5
	350	3.9	3.5
	209	2.8	3
Upper Snake	816	23.5	23
	26	21.6	21
	21	39.8	37
Lochsa River	1,180	~~39.8~~ 31.0	29.9
N.F. Clearwater River	2,440	30.4	28.5
Selway River	1,910	25.0	23.9

[1] Planimetered from water-yield maps.

DISCUSSION

Water-yield maps should be drawn on a large scale to provide adequate detail for water management and project planning on small watersheds. To more accurately represent water yield, quadrangle sheets (scale 1:250,000) were used to draw water-yield maps based on elevation and modified by slope-aspects on the basis of vegetation types.

On these maps the water yield from watersheds in Idaho varies from less than 1 inch in the plains and foothills to more than 40 inches in the highest mountains. The depth-area relationships for the Snake River Basin compared to the United States as a whole are shown in table 8.

The national forests and parks in the high mountains were found to supply 82 to 95 percent of the perennial flow of major rivers (table 9), whereas previous estimates indicated that as little as 40 to 50 percent of the total water in the West comes from the national forests (5, 7).

TABLE 8.--Comparison of depth-area relationships for Snake River and U.S.

Runoff depth	Snake River Basin[1]		United States[2]	
	Drainage area	Water yield	Drainage area	Water yield
Inches	Percent of total		Percent of total	
40+	0.3	2	1.1	7.6
20+	7.6	32.6	10.7	40
10+	21	64.5	38.1	84.8
5+	38.8	85.7	46.6	92.2
1+	63.6	97.5	68.5	98.6
0+	100	100	100	100

[1] See Literature Cited, (6).
[2] See Literature Cited, (3).

TABLE 9.--Percentage of annual water yield from the national forests and parks in the Snake River

Drainage basin	Annual water yield[1]	
	Total	Percentage from national forests and parks
	Acre-feet	Percent
Upper Snake, Wyoming-Idaho	6,500,000	93
Boise-Payette, Idaho	4,700,000	87
Salmon River, Idaho	7,800,000	95
Middle Snake River, Hells Canyon	24,000,000	82

[1] Planimetered from water-yield maps.

Although such factors as latitude, slope-aspect, geology, soils, cover, and land use modify the simple relationship of water yield to elevation, surprisingly little variation in predicted runoff occurs within the Snake River Basin. Probably the variation of conditions on the larger streams, averaged into this study, does not exceed the considerable errors inherent in the basin-wide network of gages (6).

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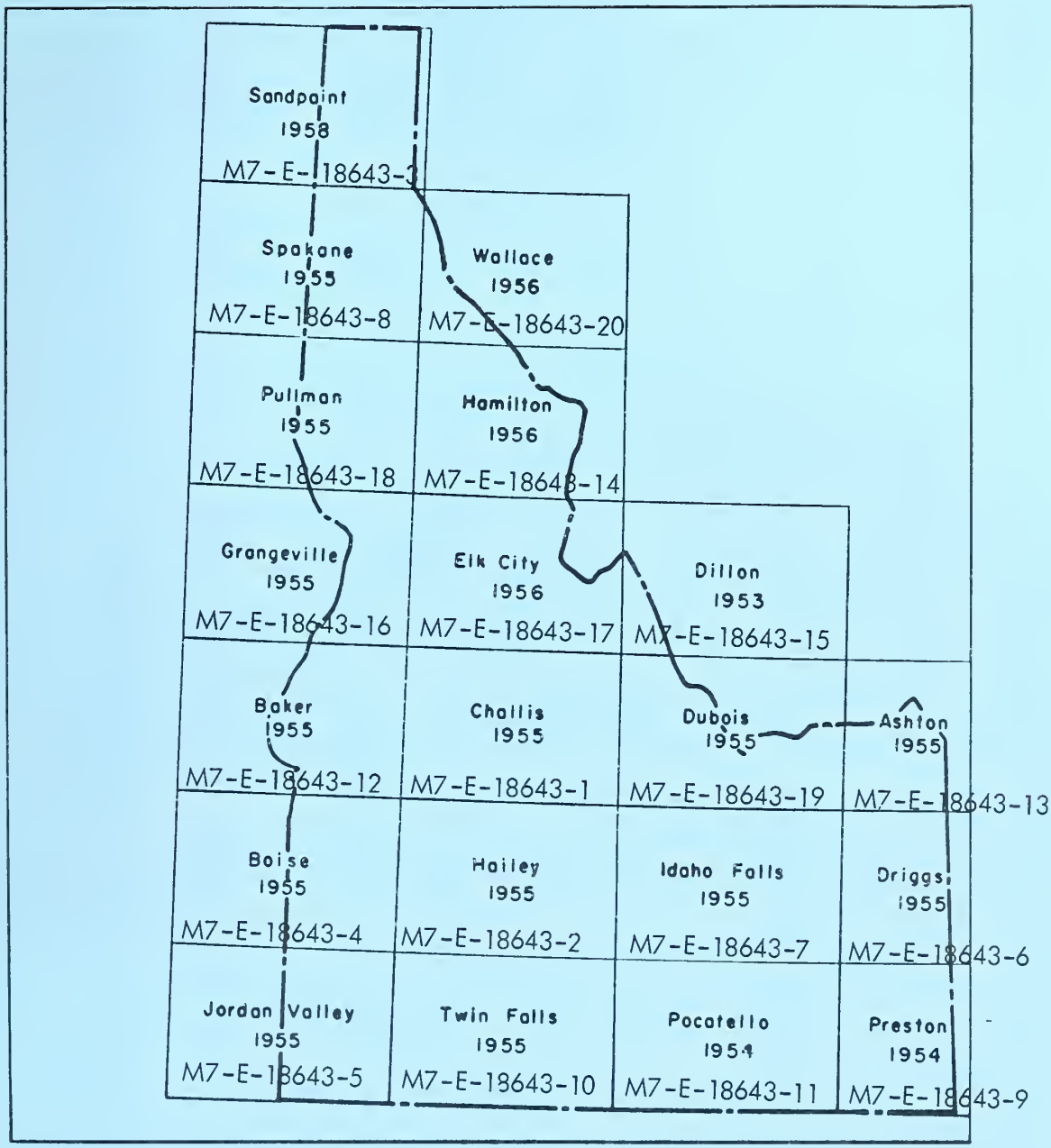

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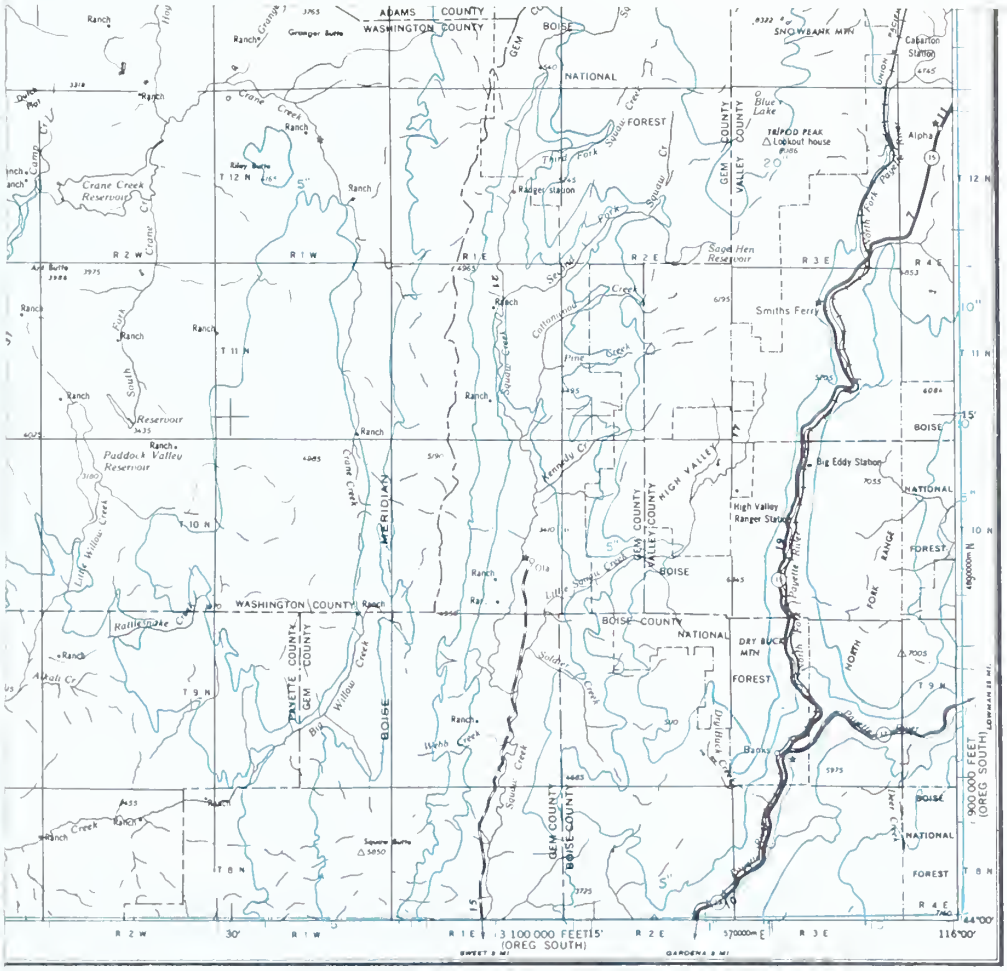

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Huntington
Richland
Homestead
Oregon Trail Memorial Bridge
Brownlee Dam
Brownlee Reservoir
Oxbow Dam
Oxbow Reservoir
Hells Canyon Dam
Hells Canyon Reservoir
Cascade Reservoir
Payette Lake
Crane Creek Reservoir
Pollock Valley Reservoir
Indian Mountain Radar Station
Cascade Ranger Station
Weiser Ranger Station
McCall Ranger Station
Cove Ranger Station
Council Ranger Station
Midvale Ranger Station
Olds Ferry Ranger Station
Huntington Ranger Station
Homestead Ranger Station
Baker Ranger Station
Ontario Ranger Station
Oregon Trail Memorial Bridge
Diversion Dam
Weiser Cove
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Brownlee Reservoir
Oxbow Reservoir
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Cascade Reservoir
Payette Lake
Crane Creek Reservoir
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Cascade Ranger Station
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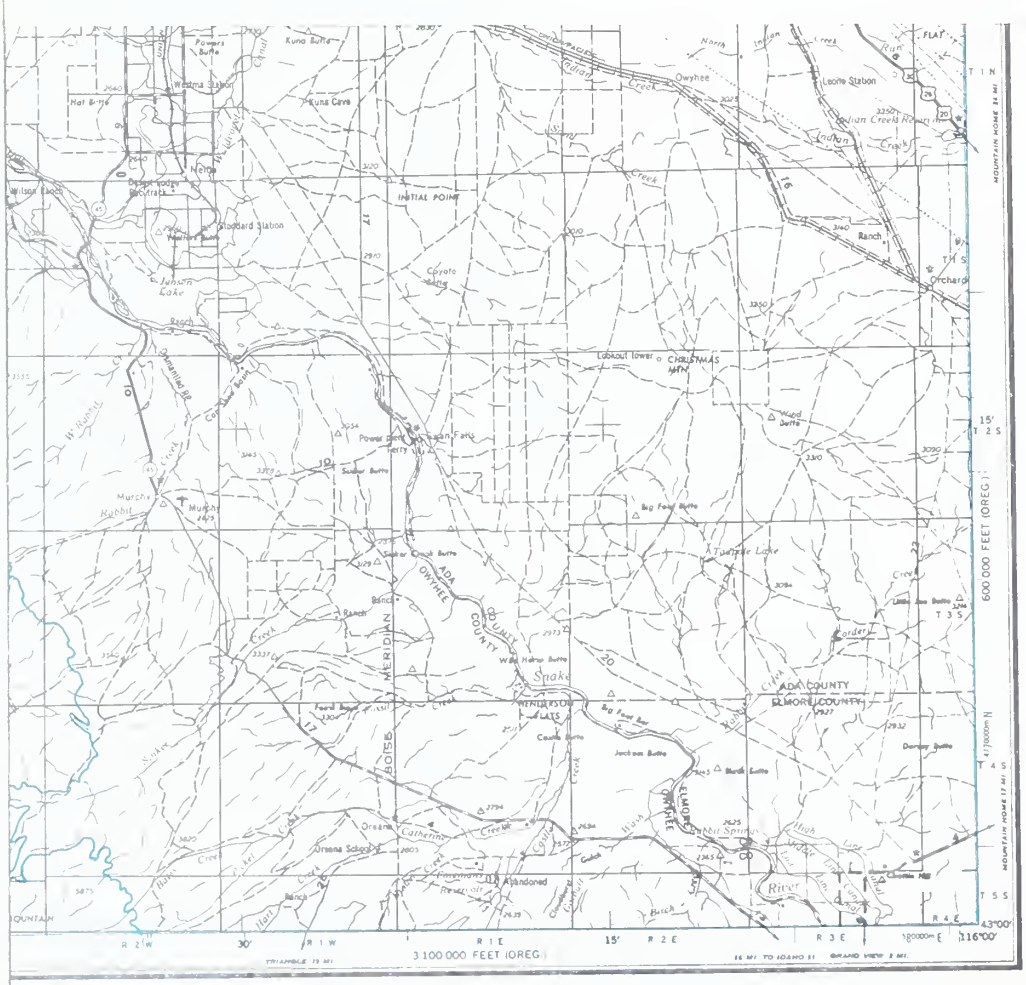

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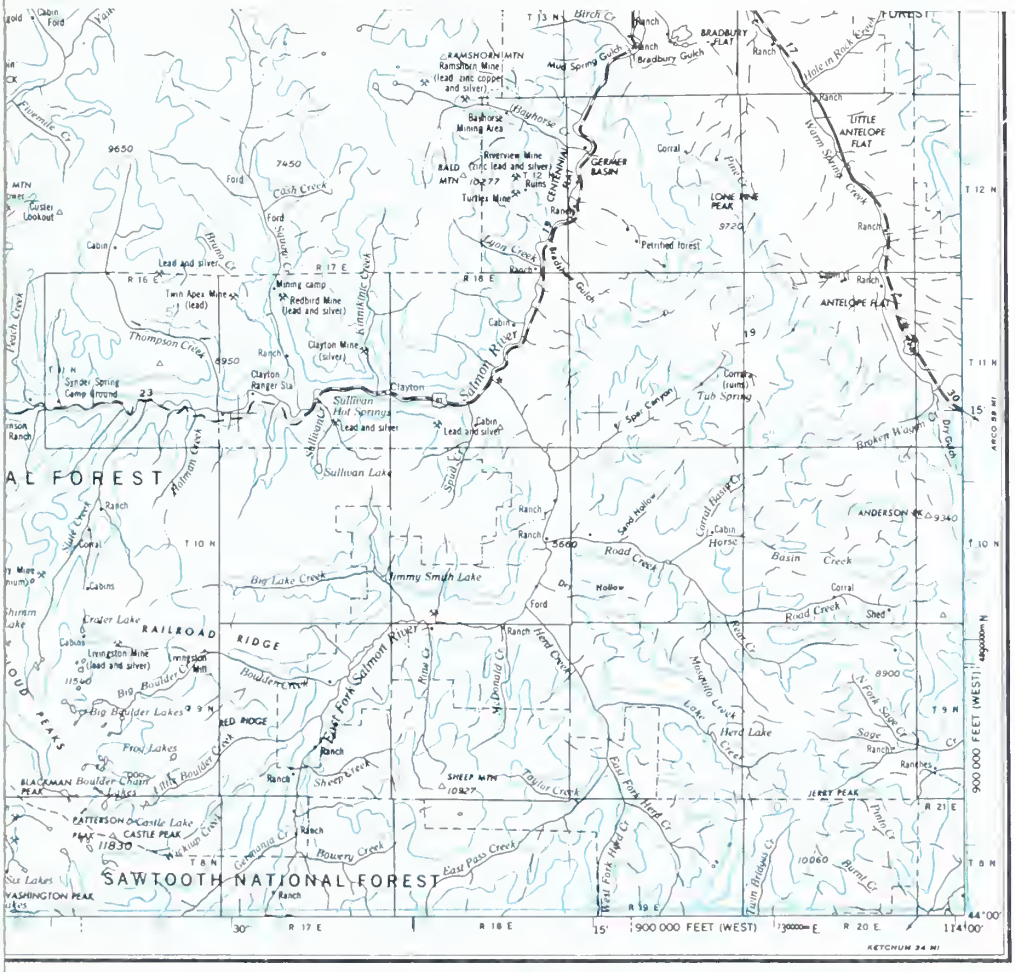

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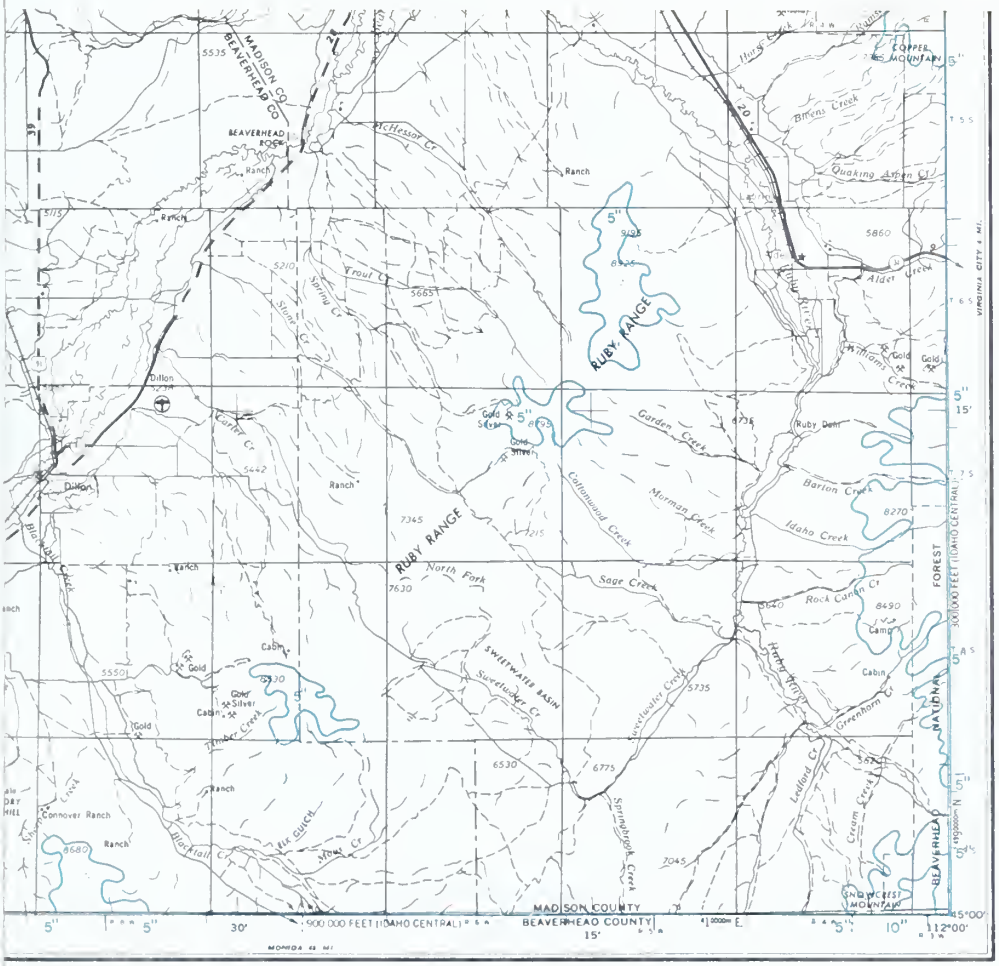

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BITTERROOT NATIONAL FOREST
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Jefferson River
Ruby Range
Tobacco Root Mountains
Highland Mountains
Pioneer Mountains
Snowy Range
Lemhi Range
Beaverhead Range
Silver Bow Co
Madison Co
Beaverhead Co
Lemhi Co
Ravalli Co
Deer Lodge Co
Jefferson Co
Silver Bow Creek
Grasshopper Creek
Horse Prairie Creek
Red Rock Creek
Willow Creek
Camas Creek
Big Hole Divide
Big Hole Pass
Lima Peak
Dillon
Silver Bow
Melrose
Jackson
Wisdom
Wise River
Polaris
Dubois
Sheridan
Ennis
Alder
Twin Bridges
Pony
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Pioneer Mountains
Tobacco Root Mountains
Highland Mountains
Ruby Range
Lemhi Range
Beaverhead Range
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Gros Ventre River
Hoback Canyon
Hoback River
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Fish Creek Ranch
Pass Peak
Fortress Hill
Clear Butte
Black Butte
Kismet Peak
Signal Hill
Hoback Peak
Clause Peak
Ramshorn Peak
Game Hill
Jack Creek Basin
Tosi Creek Basin
Tosi Peak
Hodges Peak
Klondike Hill
Ranger station
Numerous small ponds
Numerous small lakes
Mosquito Lake
Lunch Lake
Brewster Lake
Pinnacle Peak
Steamboat Peak
Corner Peak
Darwin Peak
Black Peak
Sportsman Ridge
Bacon Ridge
Triangle Peak
Palmer Peak
Doublefoot Peak
Pyramid Peak
Cow Gulch
Coyote Gulch
Middle Hoback Creek
South Hoback Creek
South Fork Fish Cr
Spring Cr
Green River
Teton Creek
Tosi Creek
Lunch Creek
Bull Creek
Deer Ridge
Shoal Cr
Cliff Cr
Kerr Cr
Hunter Cr
Clause Cr
Adams Creek
Nipple Creek
Jack Creek
Cattle Pass
Pass Hoback Canyon
Hoback Mountain
Hoback River
South Hoback Cr
Middle Hoback Cr
Cow Gulch
Aspen Ridge
Rock Creek
Lime Creek
Bacon Ridge
Kenny Creek
Weber Cr
Mountain Creek
Cottonwood Creek
Trapper

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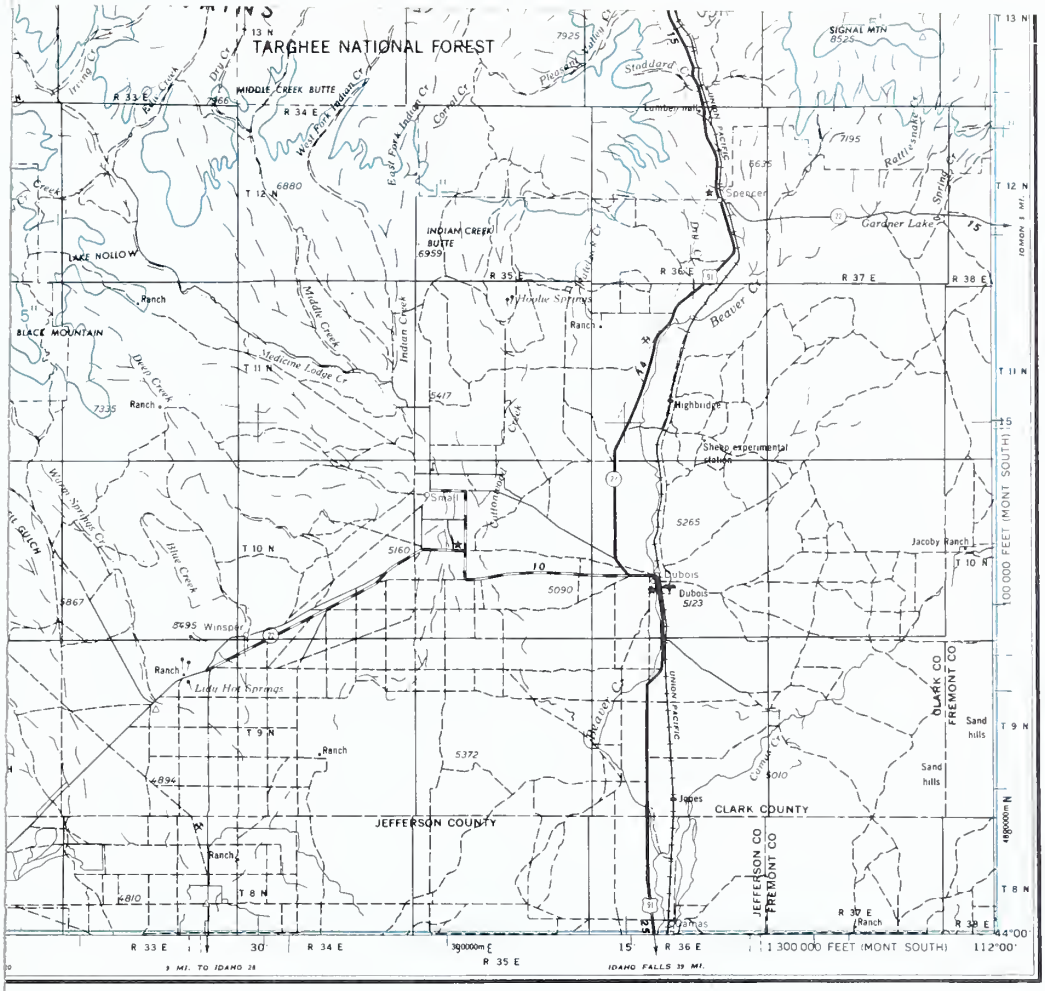

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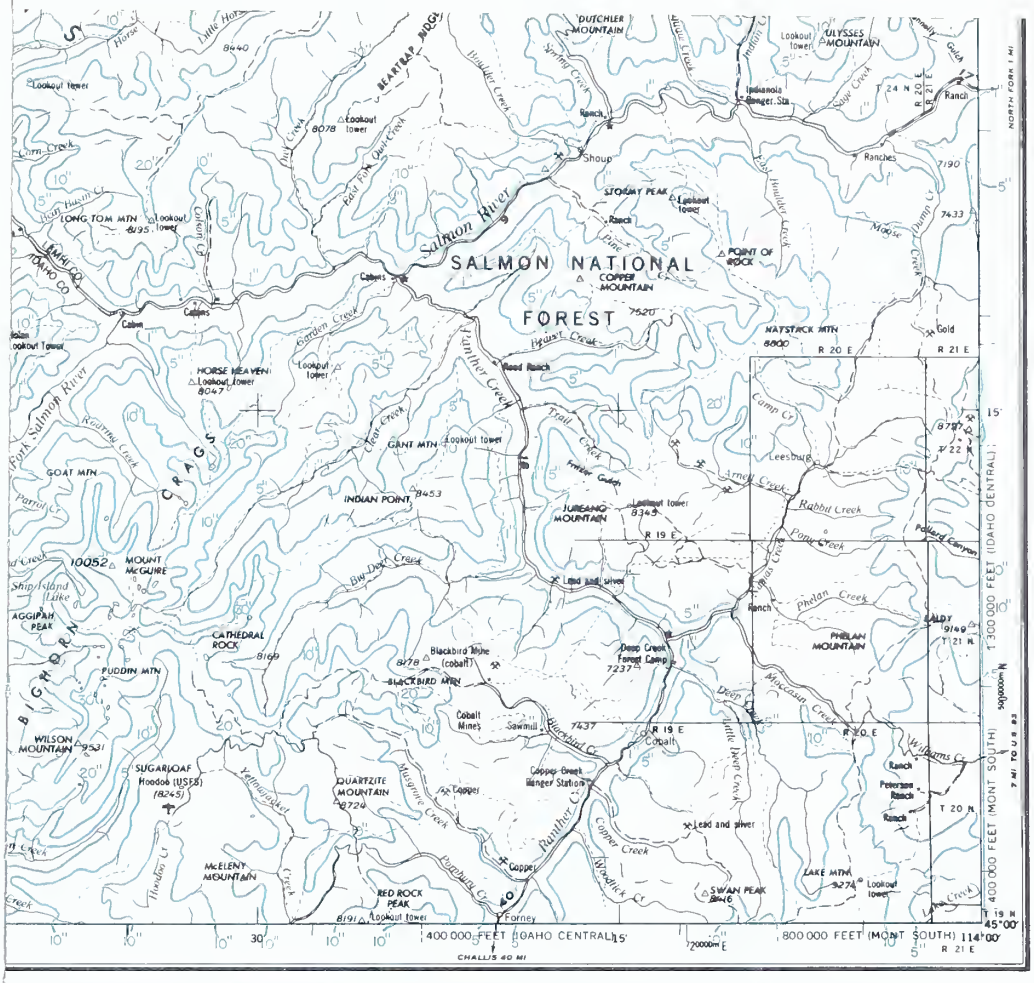
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho



AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

Moscow, Idaho

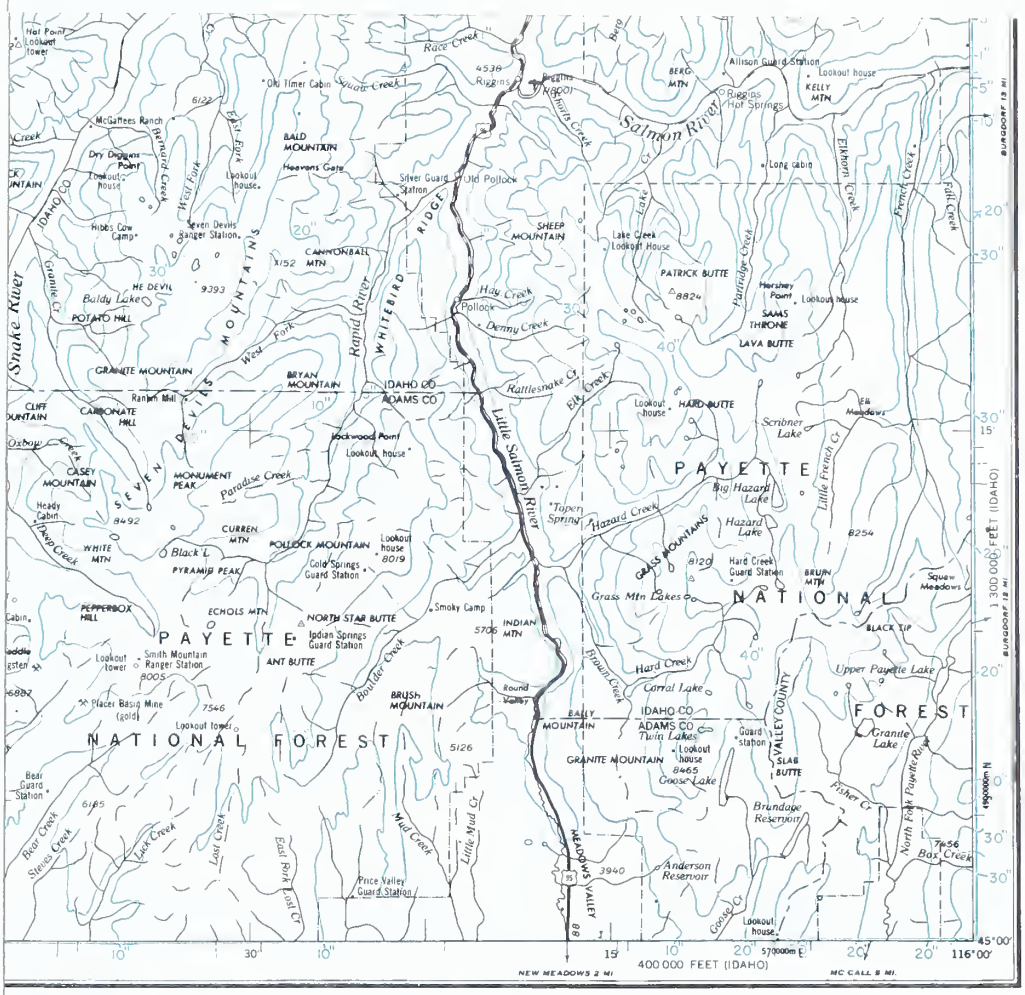
MT-5-18643-17-N

ELK CITY
QUADRANGLE

SCALE IN MILES

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho



AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

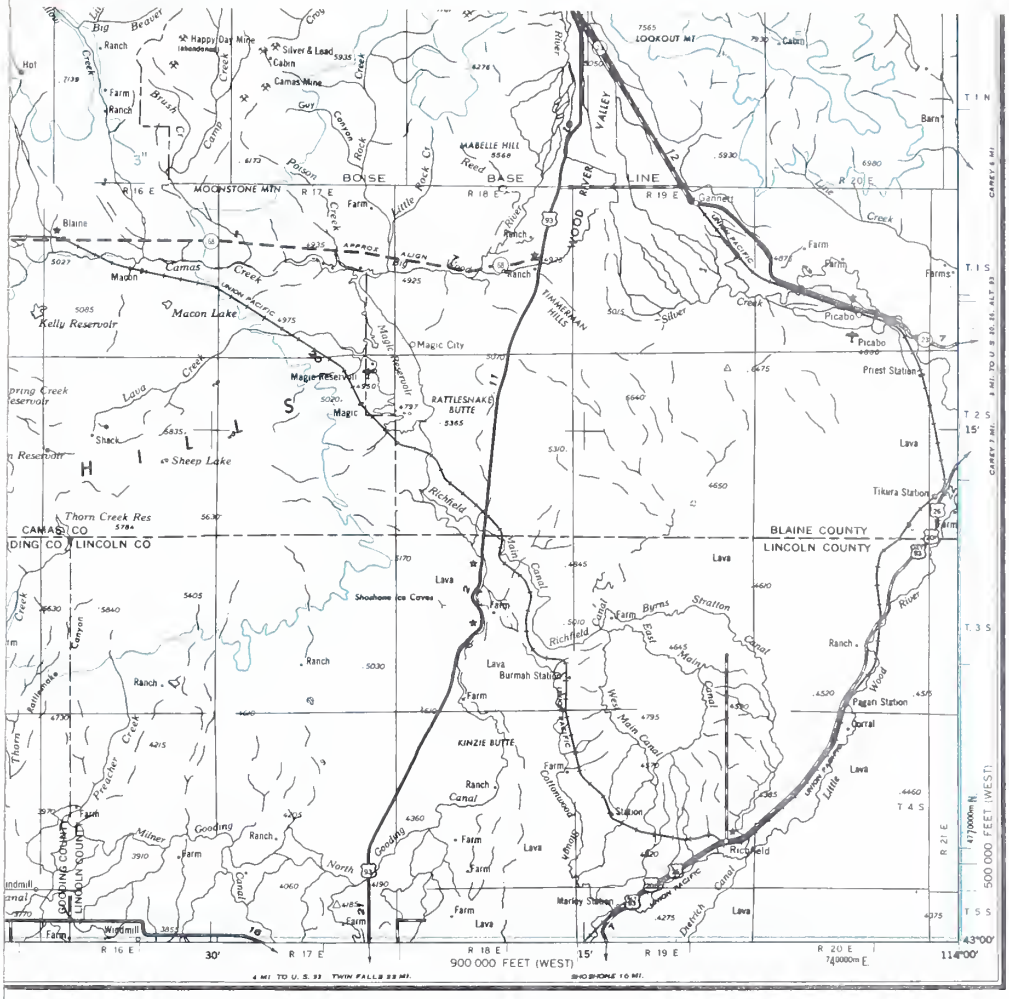
Moscow, Idaho

M7-E-18643

GRANGEVILLE
QUADRANGLE

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho



AGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

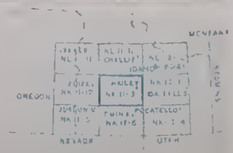
SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

Moscow, Idaho

M7-E-18643-2-N

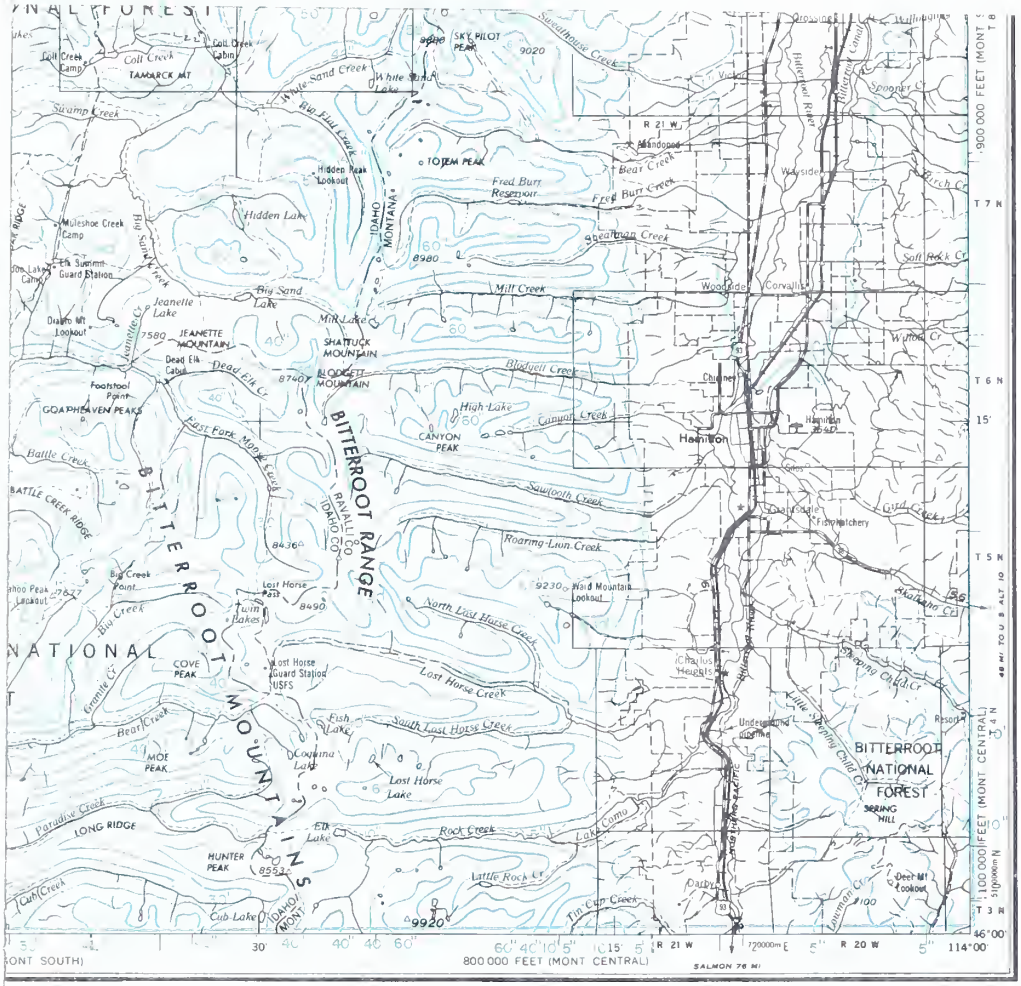
HAILEY
QUADRANGLE



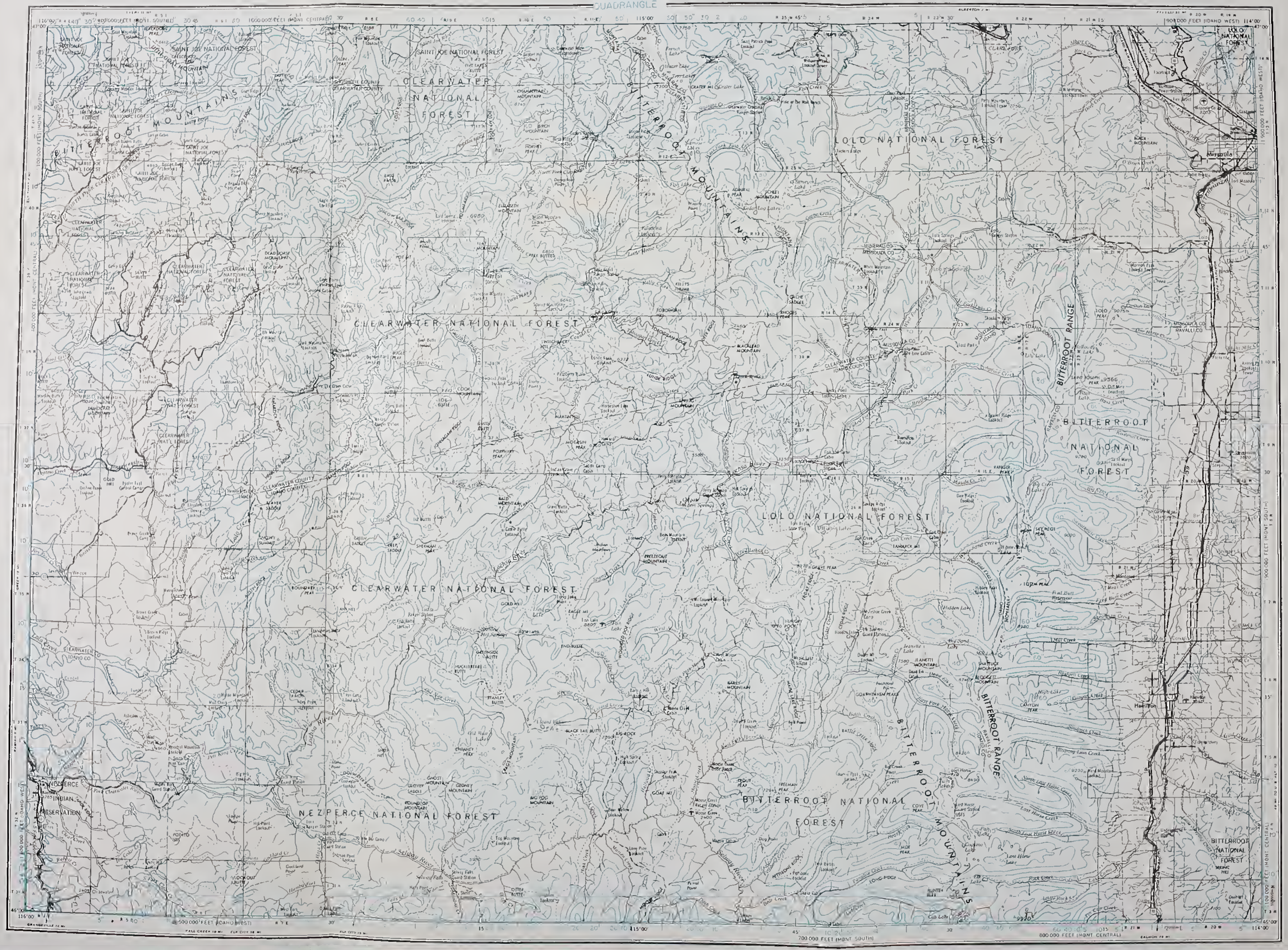
SCALE IN MILES

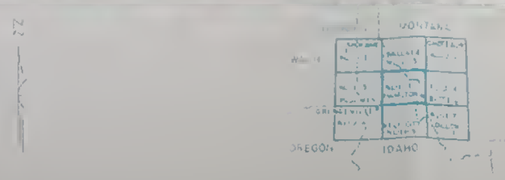
AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
OIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho


BITTERROOT RANGE
BITTERROOT MOUNTAINS
BITTERROOT NATIONAL FOREST
SKY PILOT PEAK
TOTEM PEAK
TAMARACK MT
Hidden Lake
Fred Burr Reservoir
Big Sand Lake
Mill Lake
JEANETTE MOUNTAIN
SHATTUCK MOUNTAIN
BLODGETT MOUNTAIN
GOAPHEAVEN PEAKS
CANYON PEAK
High Lake
Hamilton
Corvallis
Darby
Lost Horse Lake
Twin Lakes
COVE PEAK
MOE PEAK
LONG RIDGE
HUNTER PEAK
Elk Lake
Cub Lake
Deer Mt Lookout
Ward Mountain Lookout
Charlos Heights
Fish Hatchery
Underground Mine
Sawtooth Creek
Roaring Lion Creek
Lost Horse Creek
Rock Creek
Lake Como
Tin Cup Creek
Little Rock Cr
Bitterroot River
Lawrence Creek
Deer Creek
Bear Creek
Muleshoe Creek Camp
Elk Summit Guard Station
Diamond Mt Lookout
Footstool Point
Dead Elk Cabin
Dead Elk Cr
Jeanette Lake
Big Sand Creek
Big Creek
Big Creek Point
Lost Horse Guard Station USFS
Fish Lake
Coquina Lake
Paradise Creek
Cub Creek
Little Sleeping Child Cr
Sleeping Child Cr
Willow Cr
Soft Rock Cr
Spooner Cr
Wallburg
Victor
Stevensville
Florence
Lolo
Darby
Chuckstone
Hamilton
Corvallis
Woodside
Wayside
Abandoned
Chelmer
Blodgett Creek
Canyon Creek
Mill Creek
Meadow Creek
Sawtooth Creek
Roaring Lion Creek
North Lost Horse Creek
South Lost Horse Creek
Lost Horse Creek
Rock Creek
Little Rock Cr
Tin Cup Creek
Lawrence Creek
Deer Creek
Bear Creek
Willow Cr
Soft Rock Cr
Spooner Cr
Sleeping Child Cr
Little Sleeping Child Cr
Kalkalno Cr
Bitterroot River
Hillsboro Canal
Hillsboro Ditch
Hamilton Canal
Hamilton Ditch
Darby Canal
Darby Ditch
Lake Canal
Lake Ditch
Big Sand Creek
Big Fland Creek
White Sand Creek
White Sand Lake
Swamp Creek
Coll Creek
Coll Creek Camp
Coll Creek Cabin
Sawthouse Creek
Granite Cr
Jeanette Cr
Battle Creek
Battle Creek Ridge
Paradise Creek
Cub

HAMILTON
QUADRANGLE

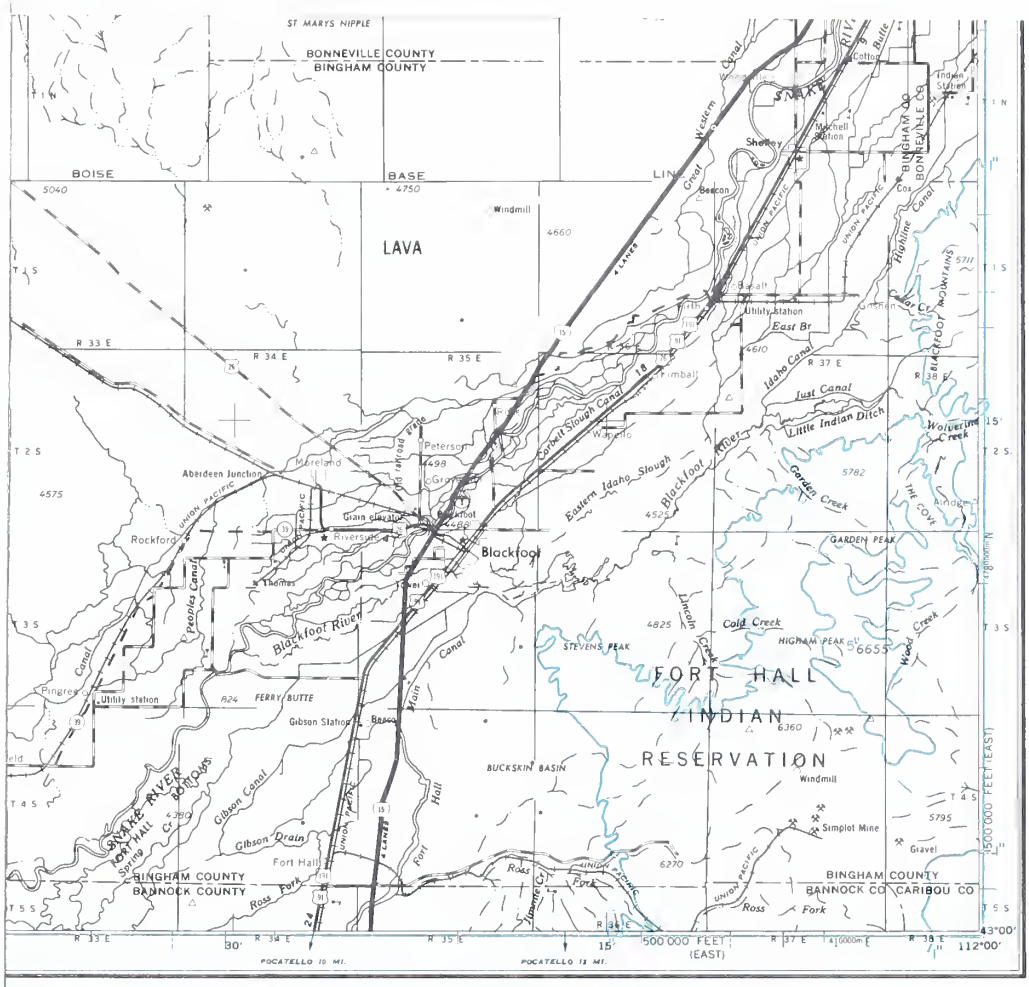




SCALE IN MILES

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho



RAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

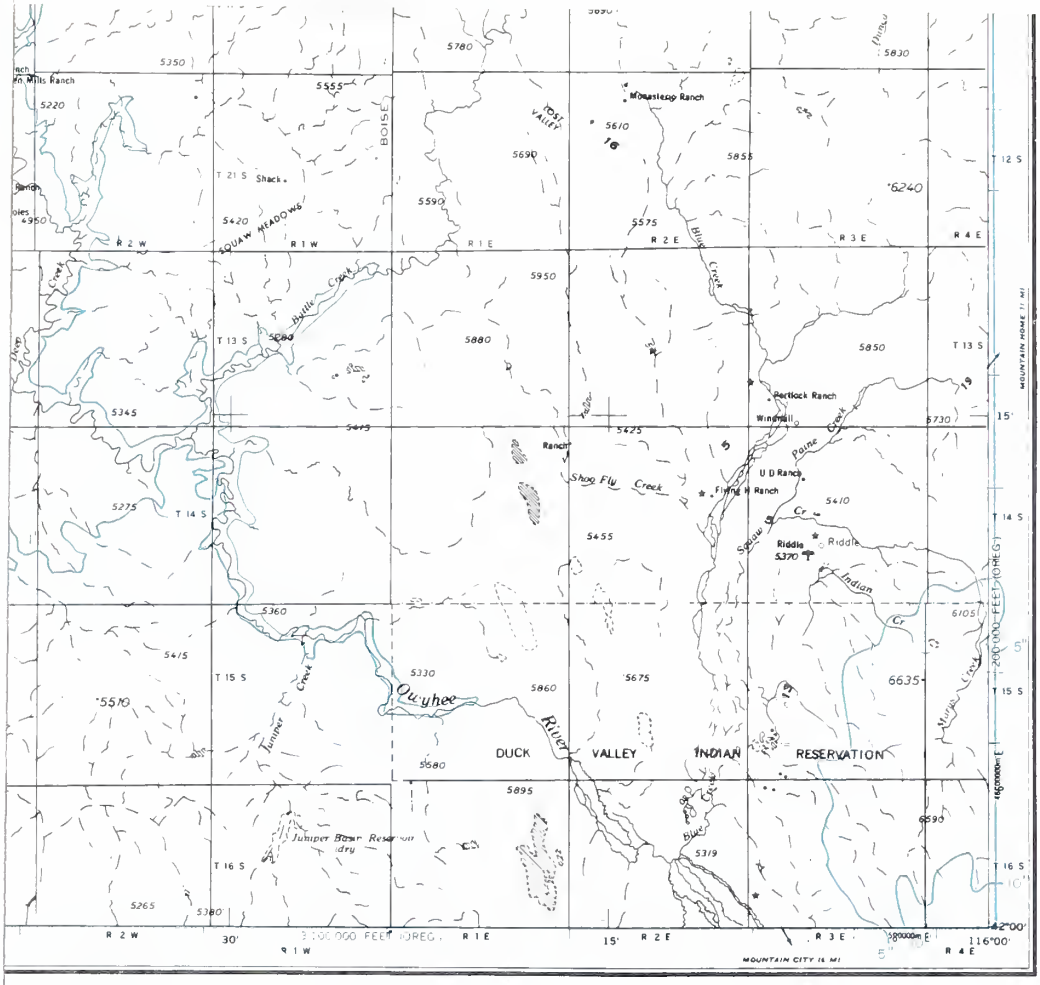
Moscow, Idaho

M7-E-6043-7-N

IDAHO FALLS
QUADRANGLE

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho



ERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

Moscow, Idaho

M7-E-18643-5-N

JORDAN VALLEY
QUADRANGLE

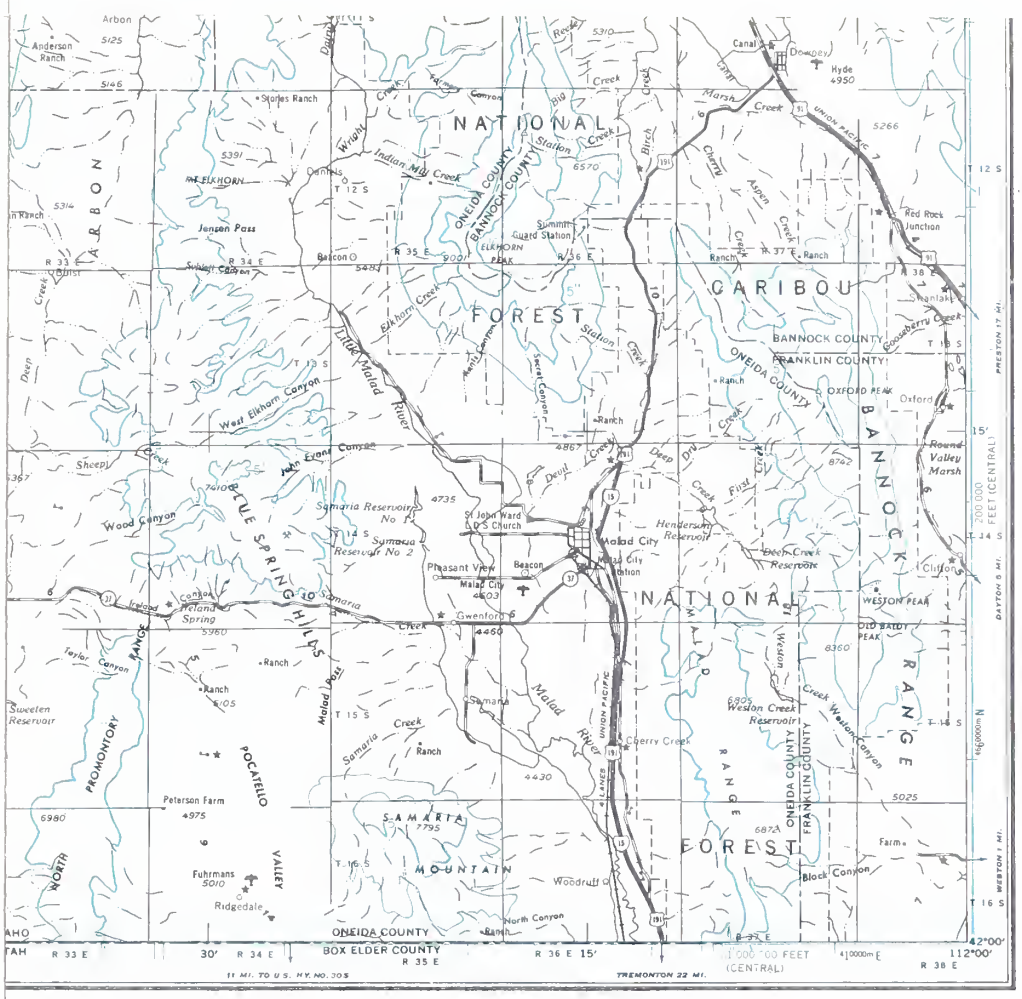
OREGON	BOISE	IDAHO HELENA
NK II-1	NK II-2	NN II-3
NN II-4	JORDAN VALLEY	TWIN FALLS
LAGRANDE	NK II-5	NK II-6
BAKER	MCDERMITT	NEVADA
NK II-7	NK II-8	NN II-9

SCALE IN MILES

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho

M7-E-18643-5-N



RAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

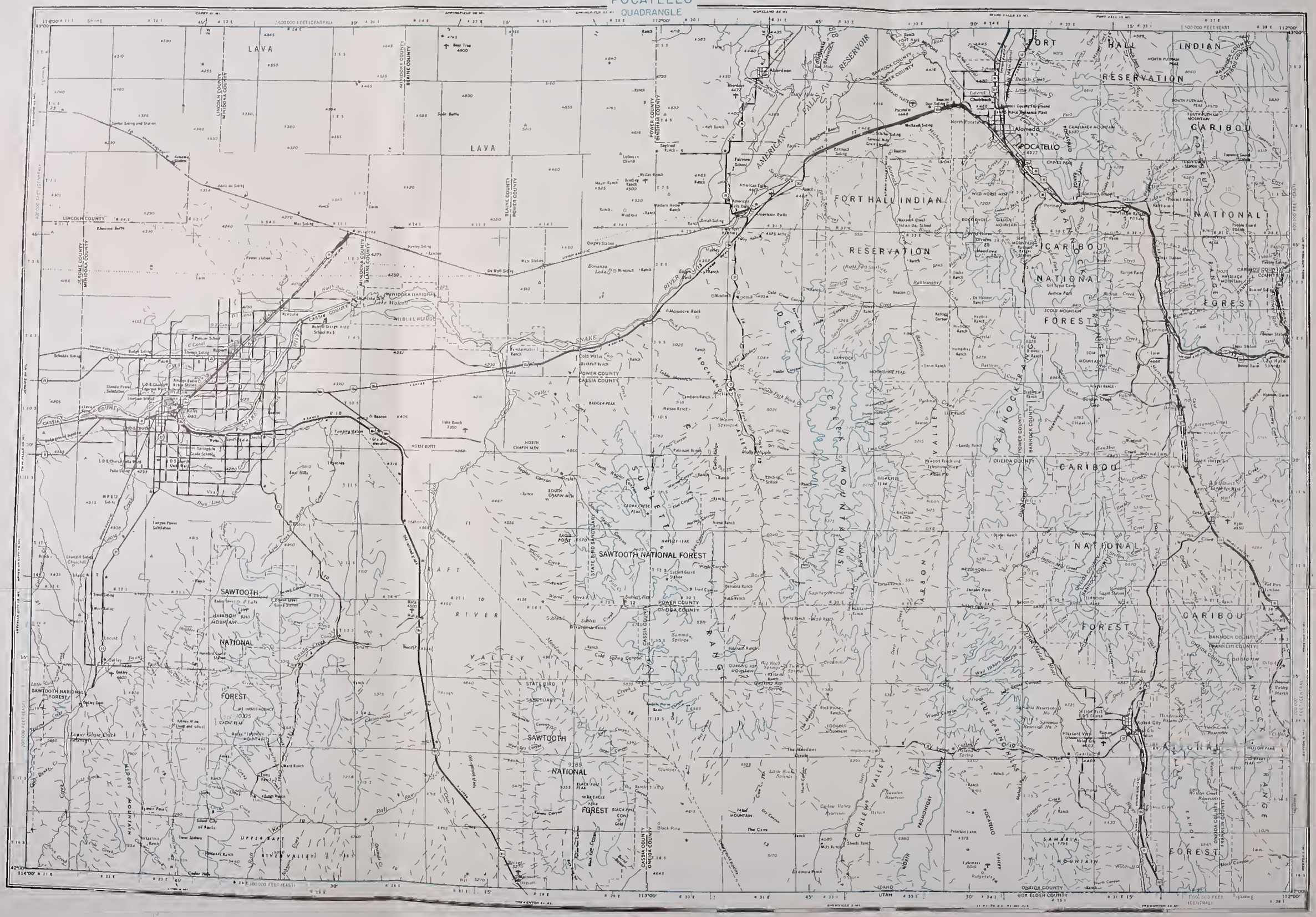
SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

Moscow, Idaho

M7-E-18643-11-N

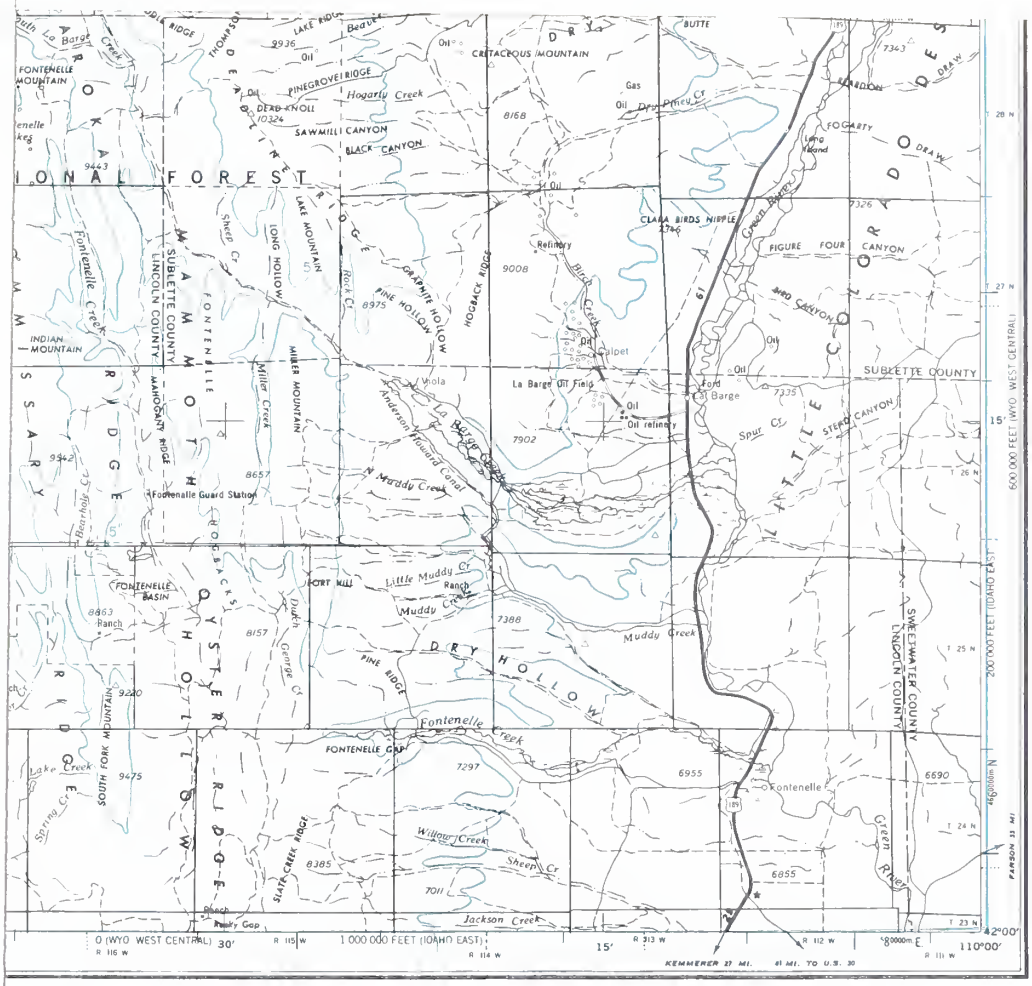
POCATELLO
QUADRANGLE



SCALE IN MILES

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WESTERN UTILIZATION RESEARCH DIVISION
PORTLAND, OREGON
1970



VERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

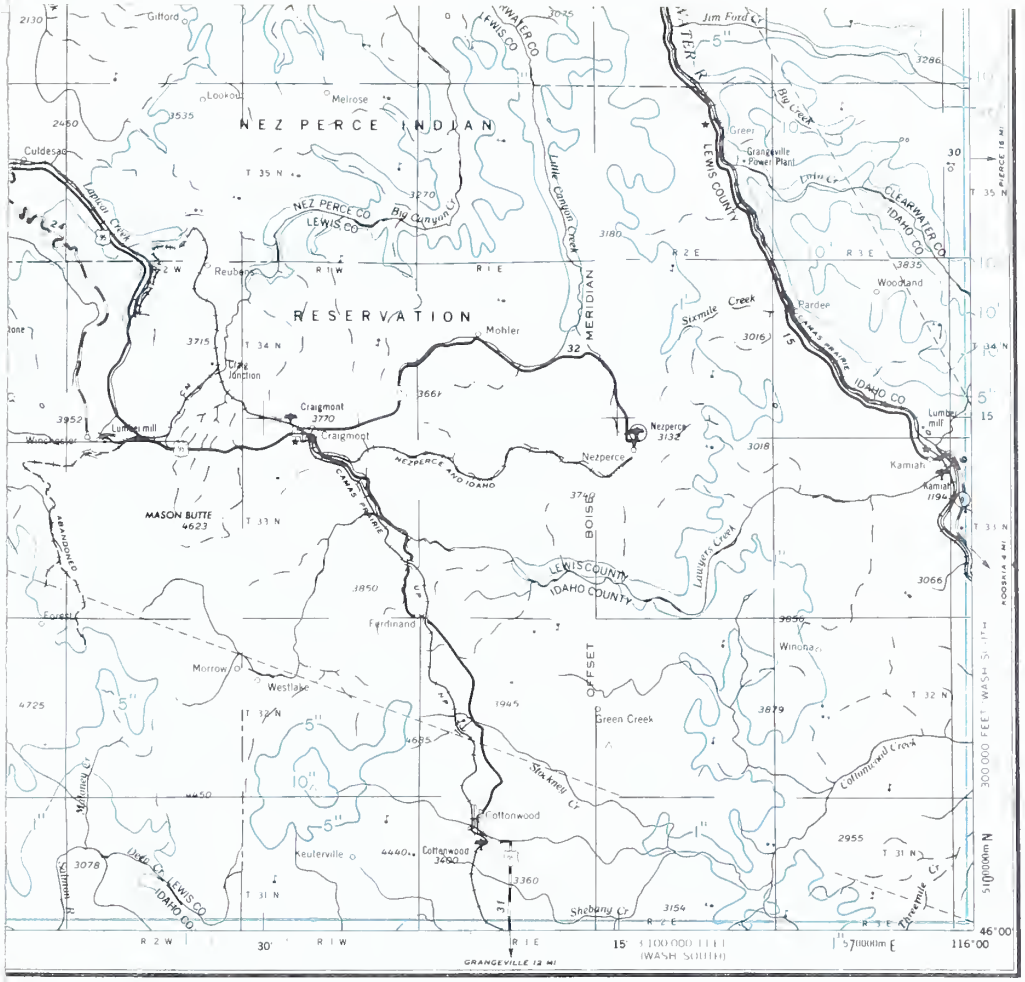
Moscow, Idaho

MT-E-E-T-O-N

PRESTON
QUADRANGLE

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho



AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION

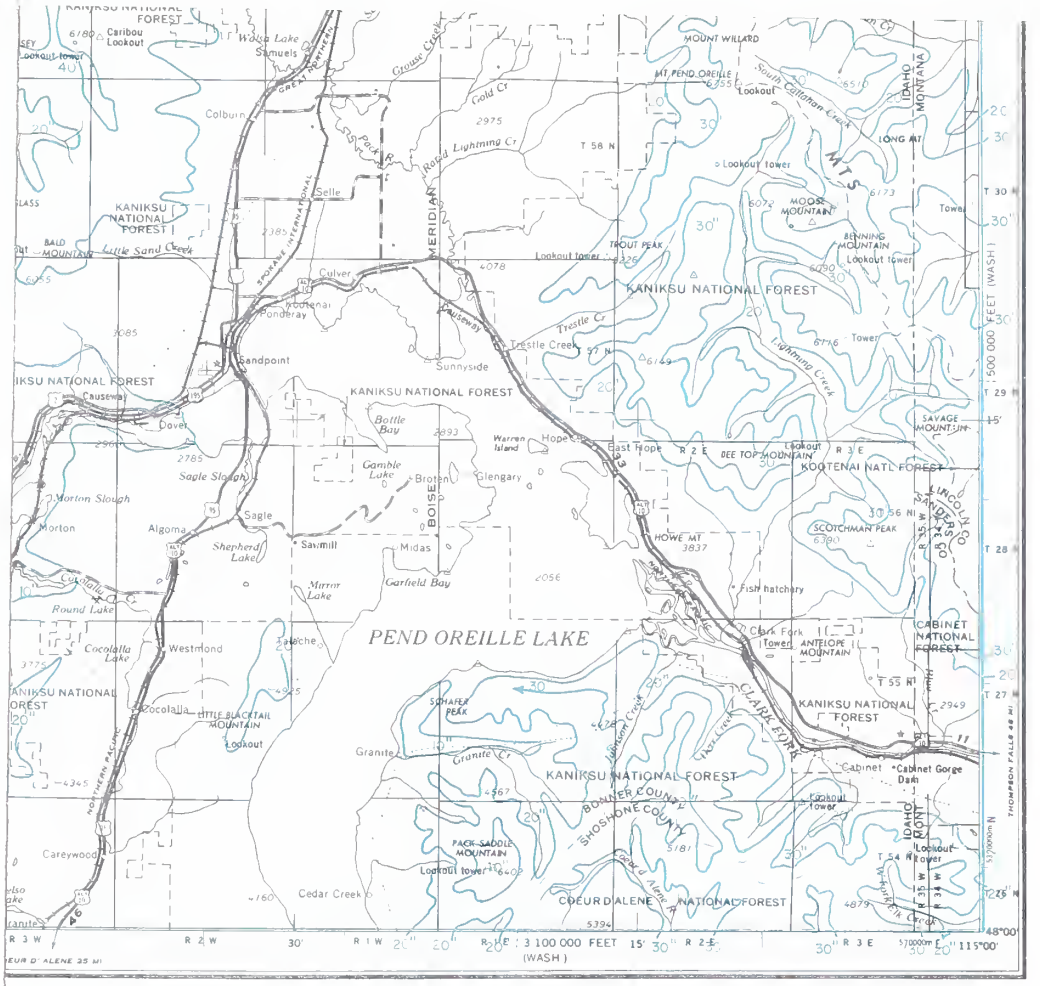
NORTHWEST BRANCH

Moscow, Idaho

M7-E-18643-18-N

PULLMAN
QUADRANGLE

Pullman
Moscow
Palouse
Colfax
Pullman Moscow Regional Airport
Pullman Municipal Airport
Whitman County Memorial Hospital
Pullman Junction
Potlatch
Deary
Troy
Kendrick
Juliaetta
Genesee
Cottonwood
Uniontown
Pomeroy
Dayton
Clarkston
Lewiston
Lewiston Orchards
Lewiston Nez Perce County Airport
Orofino
Kamiah
Nezperce
Grangeville
Cavendish
Tekoa
Elberton
Steptoe
Colton
Palouse River
Union Flat Creek
Paradise Creek
South Fork Palouse River
Hangman Creek
Rock Creek
Cottonwood Creek
Little Potlatch Creek
Big Potlatch Creek
Little Bear Creek
Big Bear Creek
Little Bear Creek
Big Bear Creek
Little Bear Creek
Big Bear

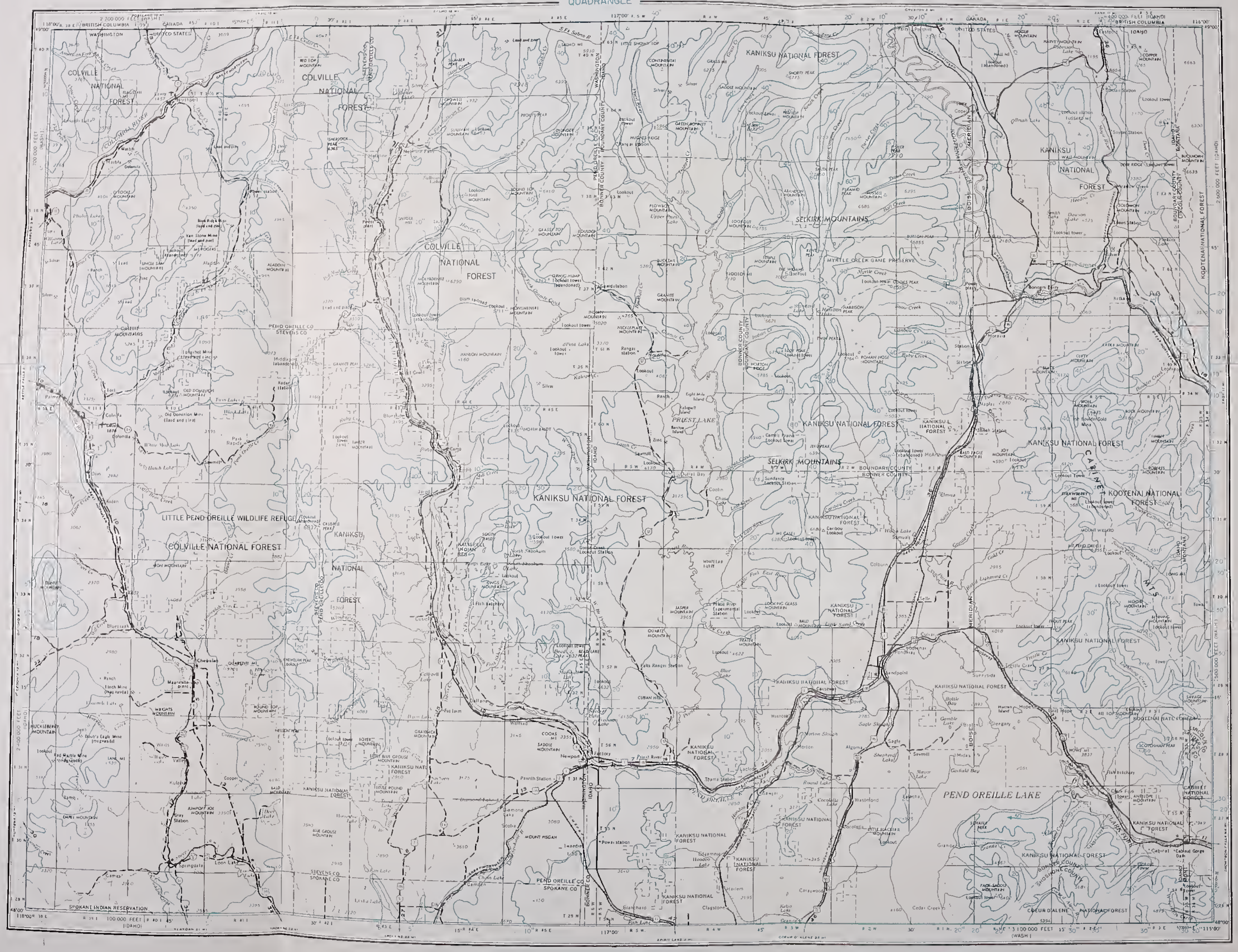


AVERAGE ANNUAL WATER YIELD IN INCHES

U S DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL and WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho

M7-E-18643-3-N

SANDPOINT
QUADRANGLE



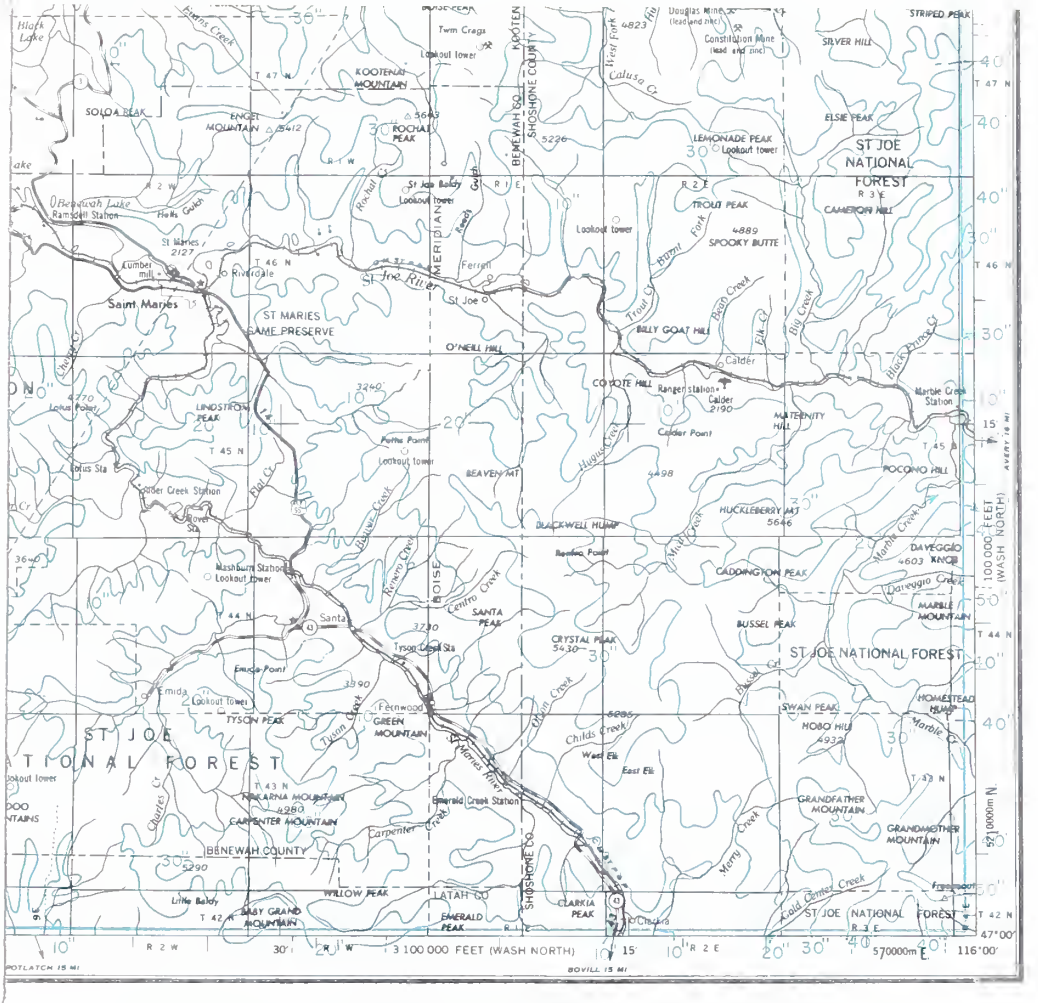
5 0 5 10 15 20

SCALE IN MILES

AVERAGE ANNUAL WATER YIELD IN INCHES

U S DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL and WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho

M7-E-18643-3-N



AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

Moscow, Idoho

M7-E-18

SPOKANE
QUADRANGLE

SPOKANE INDIAN RESERVATION
KANIKSU NATIONAL FOREST
COEUR D'ALENE NATIONAL FOREST
SPOKANE
Coeur d'Alene
COEUR D'ALENE LAKE
COEUR D'ALENE INDIAN RESERVATION
ST JOE NATIONAL FOREST
Kellogg
Wallace
Tekoa
Cheney
Opportunity
Greenacres
Liberty Lake
Millwood
Dishman
Post Falls
Saint Maries
ST MARIES GAME PRESERVE
Plummer
Rockford
Medical Lake
Deer Park
Chattaroy
Colbert
Mica
Hayden Lake
Spirit Lake
Athol
Bonner County
Kootenai County
Benewah County
Spokane County
Whitman County
Shoshone County
Latah County
Lincoln Co
Adams County
Washington
Idaho
Spokane Co
Whitman Co
Benewah Co
Latah Co
Shoshone Co
Bonner Co
Kootenai Co
Sanders County
Mount Coeur d'Alene
Red Horse Mount
Mission Park
Cataldo
Pinehurst
Silverton
Wallace
Kellogg
Mullan
Osburn
Wardner
Kingston
Cataldo
Harrison
Worley
Plummer
Tekoa
Rosalia
Fairfax
Pullman
Moscow
Potlatch
Palouse
Colfax
Pomeroy
Dayton
Ritzville
Cheney
Medical Lake
Airway Heights
Fairchild Air Force Base
Geiger Field
Spokane Int'l Airport
Coeur d'Alene Airport
Kellogg Airport
Wallace Airport
Pullman-Moscow Airport
Lewiston Airport
Pullman Station
Moscow Station
Potlatch Station
Palouse Station
Colfax Station
Pomeroy Station
Dayton Station
Ritzville Station
Spokane Station
Post Falls Station
Coeur d'Alene Station
Kellogg Station
Wallace Station
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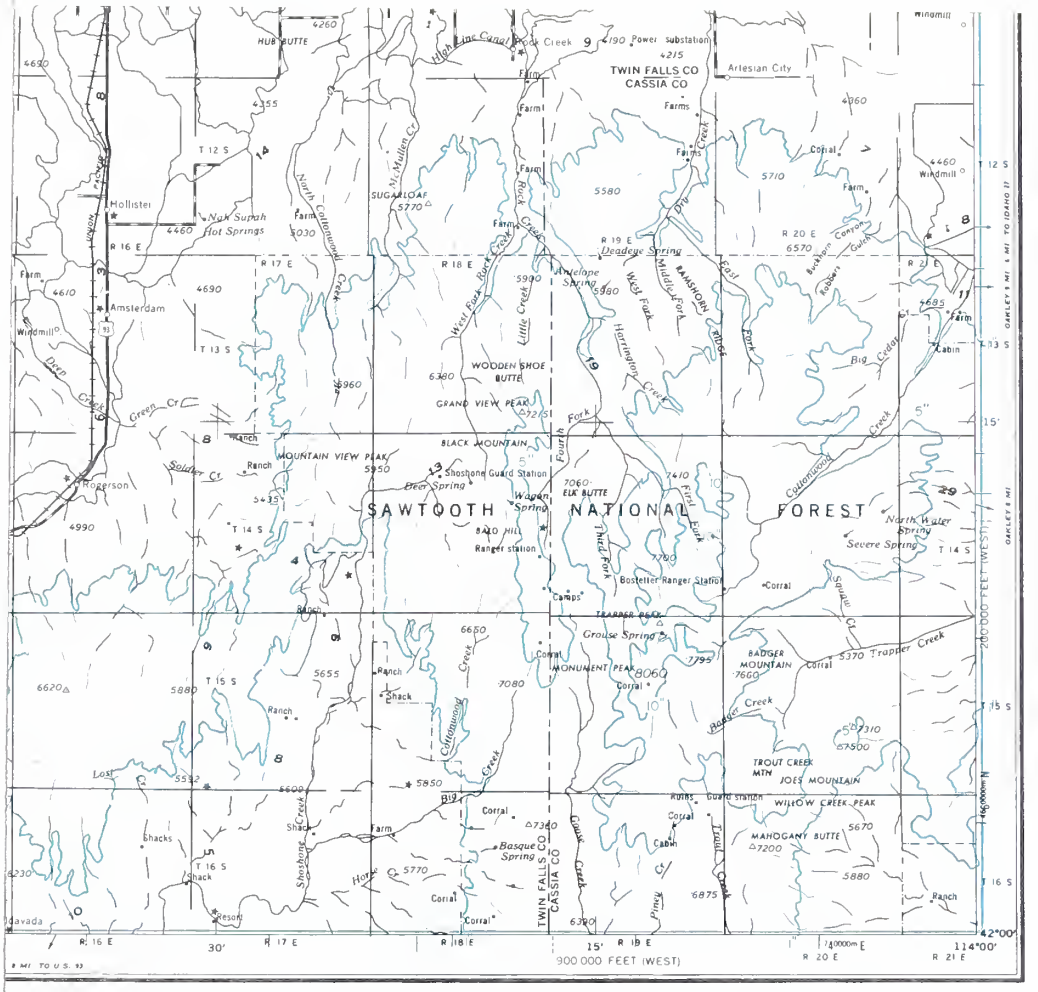
Plummer Station
Tekoa Station
Rosalia Station
Fairfax Station



ERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

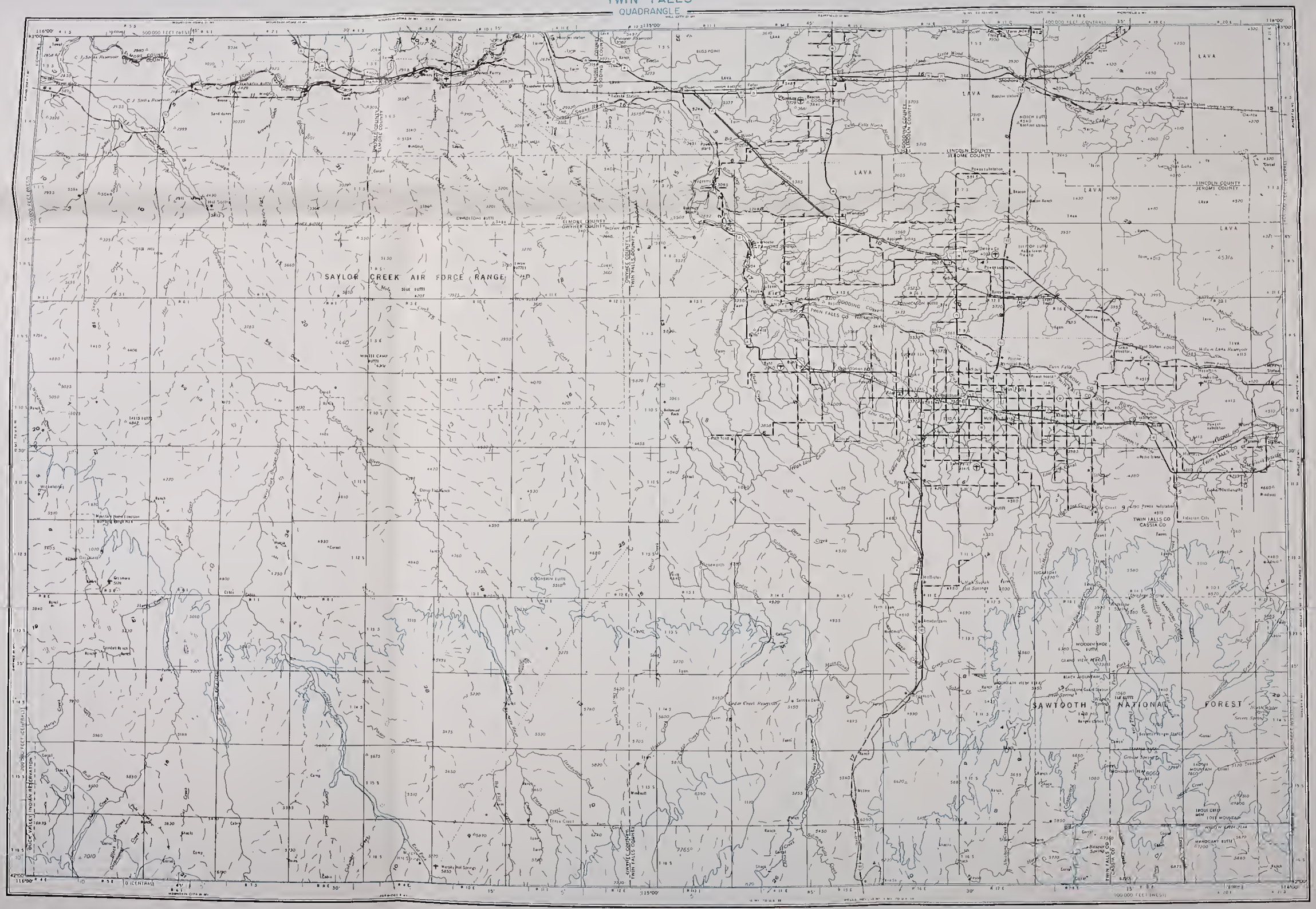
SOIL AND WATER CONSERVATION RESEARCH DIVISION

NORTHWEST BRANCH

Moscow, Idaho

M7-E-18643-10-N

TWIN FALLS
QUADRANGLE

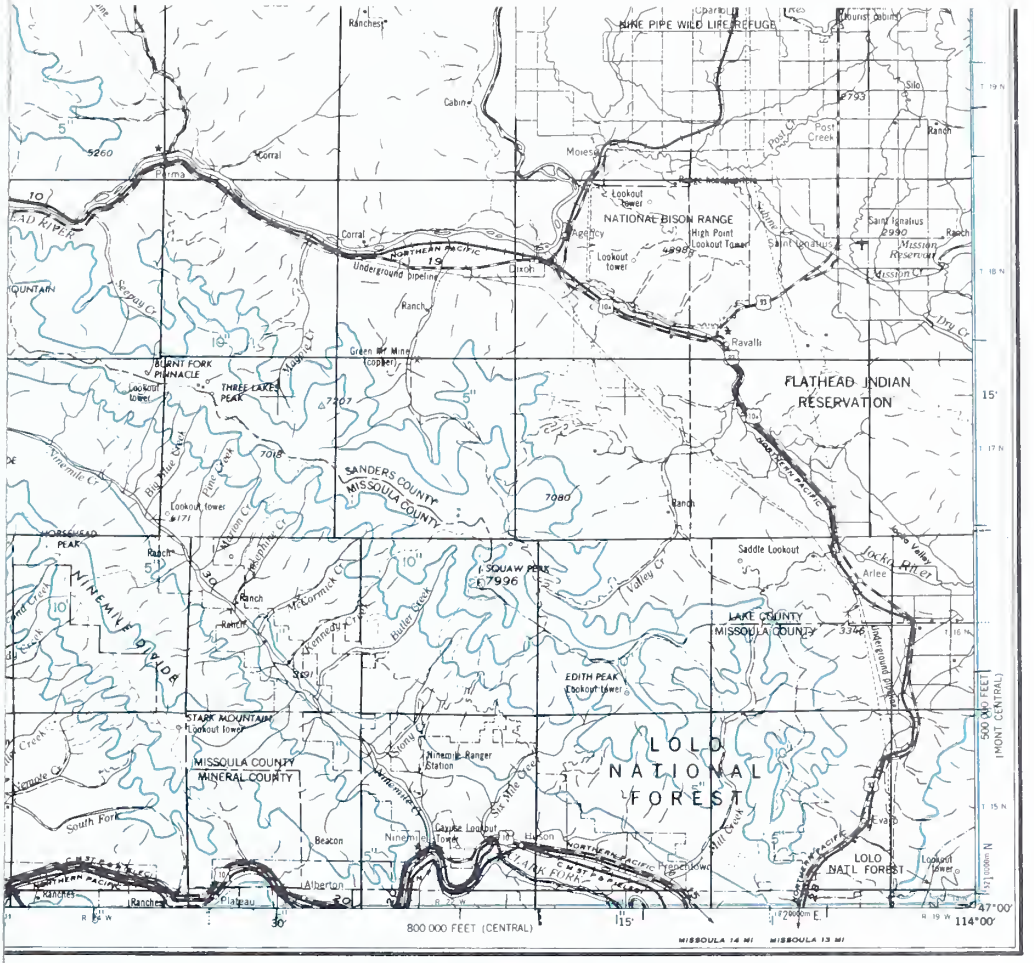


SCALE IN MILES

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho

M7-E-18643-10-N



AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho

M7-E-18643-20-N

WALLACE
QUADRANGLE

SCALE IN MILES

AVERAGE ANNUAL WATER YIELD IN INCHES

U.S. DEPARTMENT OF AGRICULTURE
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SOIL AND WATER CONSERVATION RESEARCH DIVISION
NORTHWEST BRANCH
Moscow, Idaho

M7-E-18643-20-N